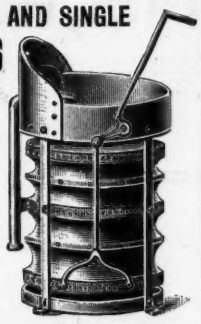
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXIII. No. 1880.] LONDON, MAY 23, 1899. [51ST YEAR. PRICE 6d.

ABSALOM HARROP
(Maker to the Admiralty),
FITZROY BELLOWS WORKS,
SHEFFIELD.

MANUFACTURER OF THE PATENT
CIRCULAR DOUBLE AND SINGLE
BLAST BELLOWS



Patent Portable Forges, Vices, and Vice-Benches, Patent Tue Irons, Anvils, Swage Blocks, &c.
Stocks and Dies, Hammers, and Smiths' Tools in general.
Telegraphic Address:
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FOR
INCANDESCENT LIGHTS,
Manufactured by
OBERFELT & CO.,
BERLIN, S2, CHARLOTTENSTRASSE.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
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Oxide Paints, Oils, and General Stores, for Gas and Water Works.
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LONDON.

ROBERT MARSHALL;
CANNEL COAL MERCHANT.
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

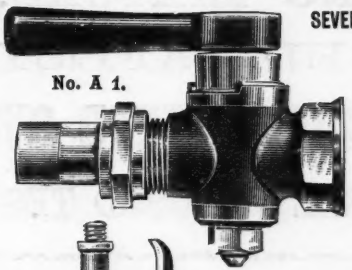
Wrought-Iron
TUBES
And Fittings and Accessories.
LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH.

BIGGS, WALL, & CO.,
GAS AND WATER ENGINEERS,
13, CROSS STREET, FINSBURY PAVEMENT,
LONDON, E.C.

WRITE FOR OUR PRICE LISTS OF
FULL-WAY MAIN TAPS & LANTERN TAPS.
SEVERAL DESIGNS SHOWN BELOW.

No. A 1.

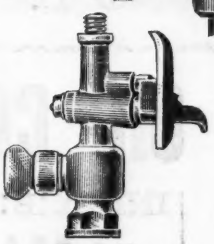
THESE TAPS ARE
FULL-WAY
AS SHOWN.



No. A 1.

SUPERIOR QUALITY AND FINISH IN GUN METAL.

LANTERN TAPS.



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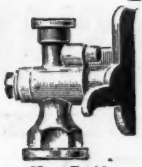

No. A 13.

No. A 12.

No. A 11.

The "DEMAND," REGISTERED. *
*Specially constructed for New Incandescent Burner.

RECOVERY OF SPENT LIMES.

G. R. HISLOP'S Patent Improved Lime Revivifying Apparatus.

SPENT LIME as carbonate is RESTORED at a cost considerably under that of New Lime, and that WITHOUT LIMIT to its DURABILITY, and with UNIMPAIRED EFFICACY as a Purifying Agent. The LIME is RESTORED on the PREMISES; ECONOMY of SPACE is SECURED by the non-accumulation of Spent Lime—thus SAVING all TROUBLE and EXPENSE in the disposal of the Lime as waste. The PROCESS can be USED in any LOCALITY without becoming a nuisance. Enquiries respectfully solicited. Full Particulars from R. F. HISLOP, F.C S., Gas Engineer, Craigielea, PAISLEY, Agent for Patentee.

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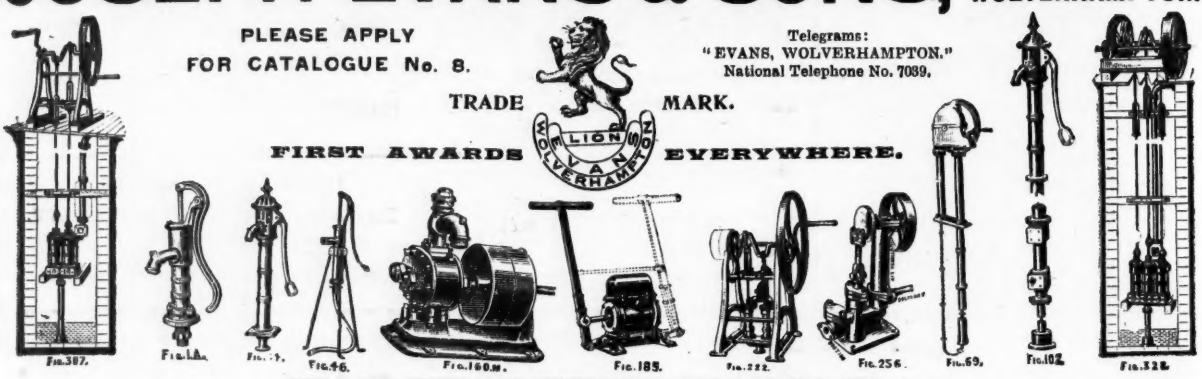

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HOMOGENEOUS IN CHARACTER.

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CAN BE STORED SAFELY ANYWHERE.

FLASH POINT GUARANTEED OVER 200° FAHR.

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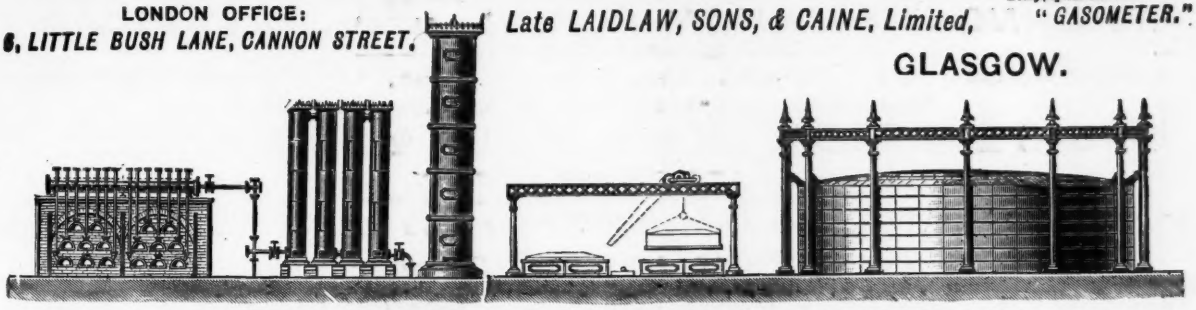
Late LAIDLAW, SONS, & CAINE, Limited,
GLASGOW.

Telegraphic Address:
"GASOMETER."



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HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

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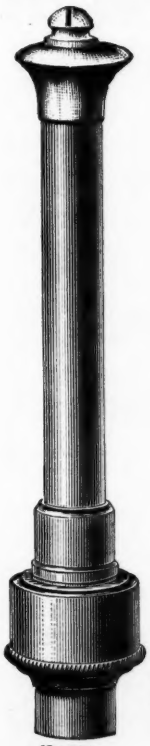

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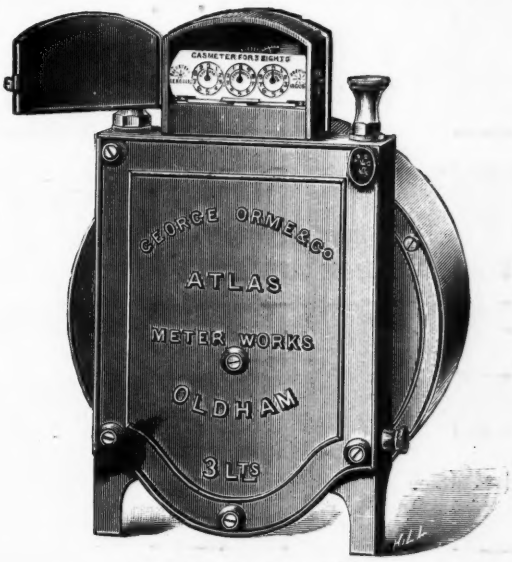

WET GAS-METER IN CAST-IRON CASE.

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RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

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PURIFIERS with Planed Joints a Speciality.

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42 MEDALS AWARDED.

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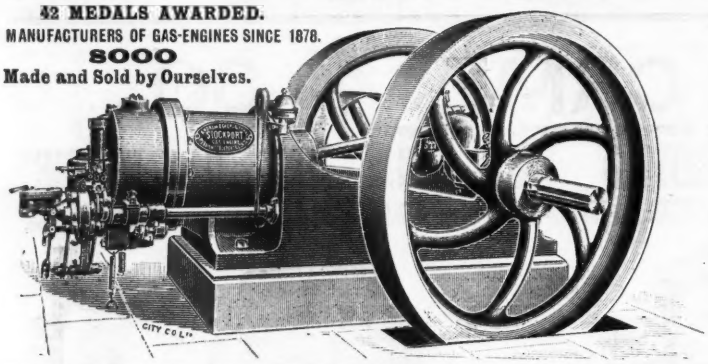

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SEND FOR LATEST PRICE LIST.

The Greatest Brake H.P. given for the Smallest Gas Consumption.

SIMPLE IN EVERY DETAIL.

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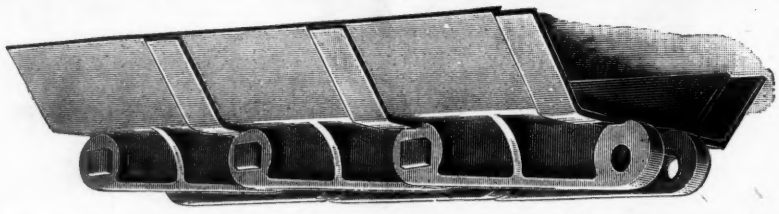

Specialities:

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The only Coke-Conveyor which has proved a thorough success.

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The fullest Inquiry invited. Can be seen at work in some of the principal Gas-Works in the United Kingdom, where they are giving the utmost satisfaction.

A Set of Twelve Condensers, 3 ft. 6 in. diameter by 30 ft. high. *From a Photograph.*

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Gas Plant and Structural Ironwork of every description.

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SPECIAL BRICKS and BLOCKS of every description for GENERATOR and REGENERATOR FURNACES.

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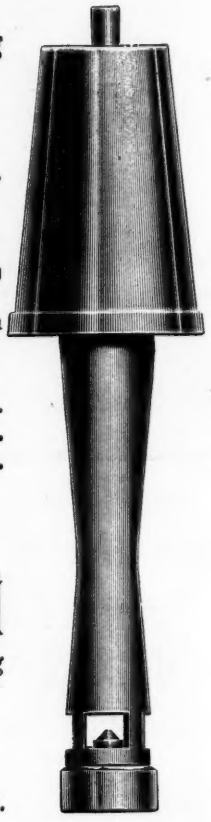
NEW WELSBACH BURNERS.

25 Candles per Cubic Foot of Gas.

For STREET LIGHTING there is nothing to excel the New Welsbach Burner as shown at Niagara Hall, London, and in the principal Provincial Towns.

The New Welsbach Burner is supplied in SIX Sizes, consuming from ¾ to 7 Cubic Feet of Gas per Hour.



For Street Lighting, the sizes recommended are Nos. 2, 3, & 4.

100 CANDLE POWER WITH 4 CUBIC FEET OF GAS.

To obtain a light of 100 Candles for 4000 hours with Gas at 2s. 3d. per 1000 Cubic Feet would cost—

With an Ordinary Gas-Burner	£18 0s.
With a new Welsbach Burner	£1 16s.
With an Incandescent Electric Lamp, at 5d. per unit	£30 0s.

THE

New Welsbach Anti-Vibration Attachment

Enables the New Welsbach Burner to be used for Street Lighting or otherwise, notwithstanding the severest vibration.

Made of Metal throughout.

Simple, Durable, Inexpensive.

Does not obstruct the Light.

HYDRO-PRESS GAS-LIGHT APPARATUS.

THE NEW METHOD OF PRODUCING A HIGH CANDLE-POWER LIGHT.

Especially recommended for use in Workshops, Railway Yards, and Open Spaces, where a high-power light from one centre is desired.

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GAS LIGHTING
Has now gained a complete and final Victory over its last and greatest Enemy
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Yield of Gas per ton	13,155 cub. ft
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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Highest Results in Gas, & Excellent Coke.
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THORNLEY GAS COALS
WORKED BY THE
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OUT OF THEIR
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Analysis made by
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Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
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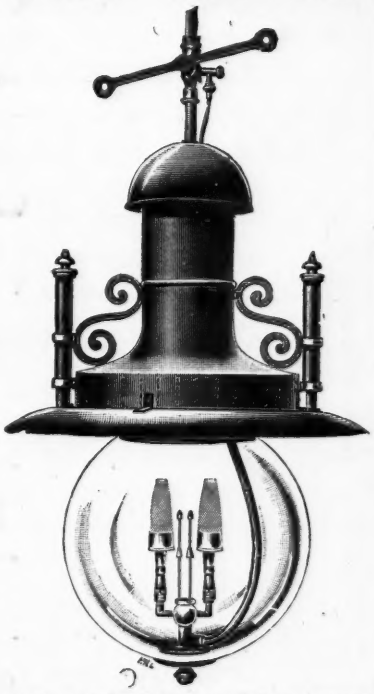
"BEACON" GLOBE LAMP.



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LIME AND COLOUR WASHER.
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PAINTING BY MACHINE.
GREAT SAVING IN TIME,
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Painting Speed—3 Square Yards a Minute. Lime-Wash Speed—12 Square Yards a Minute.

Paint Machine, attached to a Single Air-Compressor, Driven by Belt Power. Can also be driven from existing Air-Mains.

No. 1	Painter	£23	Single Air Compressor	£17	10
No. 2	,,	£30			
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OVER **250** SOLD.

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Vertical Steam-Engine and Air-Compressor combined with Boiler on Wheel Base.

Price £100.
Larger size Engine, &c., adapted for working up to 4 Machines . . . £180.
Painting Machines Extra.

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ELEVATORS & CONVEYORS for BOILER-HOUSES.

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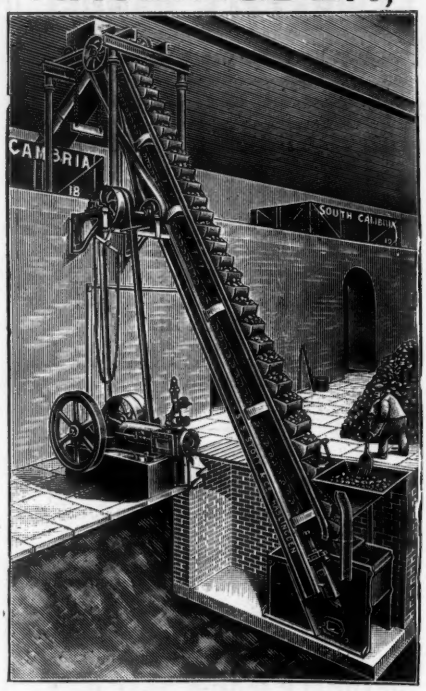

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PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

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SOLE MAKERS OF THE

"POSITIVE"

PREPAYMENT GAS-METERS

WET and DRY.

WET PREPAYMENT METER. CAST-IRON CASE.

SIMPLICITY IN MECHANISM

Combined with

STRENGTH AND COMPACTNESS.

PRICE OF GAS EASILY CHANGED.

MADE TO TAKE ANY COIN.

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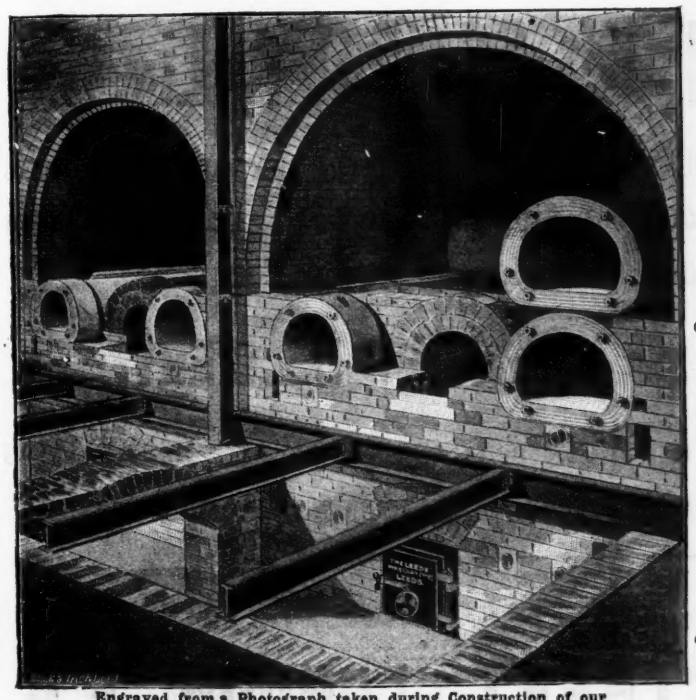

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OF EVERY DESCRIPTION

INCLINED, HORIZONTAL,

REGENERATOR, GENERATOR,

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A SPECIALITY

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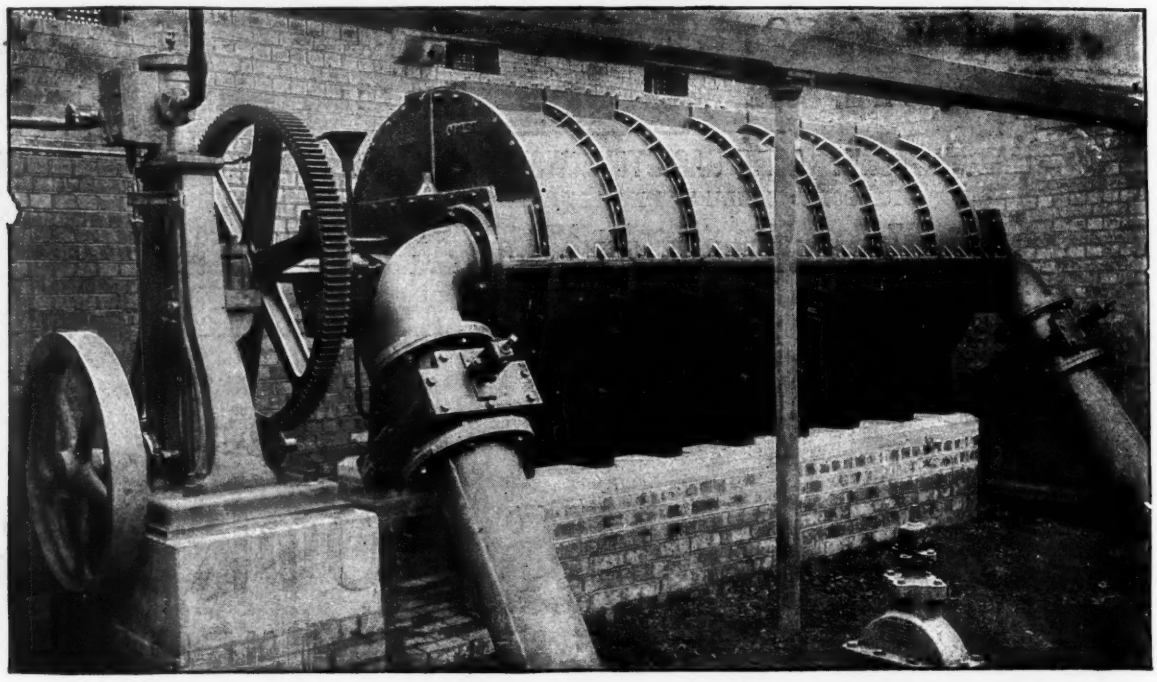
3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.



PATENT "STANDARD" WASHER-SCRUBBER

Extracts all Ammonia and a large proportion of Sulphuretted Hydrogen and Carbonic Acid.

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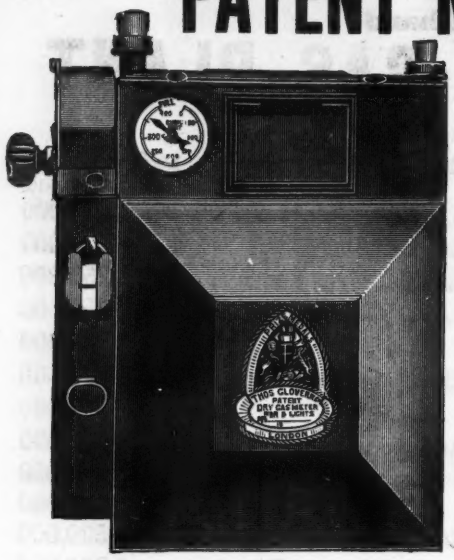

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EDITORIAL NOTES.

The Institution and the Institute.

THE Annual Meeting of the Institution of Gas Engineers is past, and that of The Gas Institute is to come. Such, briefly put, is the situation for the moment as it strikes those followers of the gas industry of the United Kingdom who take an interest in the national organizations of the profession of gas engineering. We have been very outspoken with regard to the quality of the technical fare provided for the Institution meeting; and our criticism has not been challenged. The papers accepted by the Council cannot be esteemed as setting forth with authority the actual state of professional knowledge and performance. Judged upon this consideration, the Institution has fallen short of the hopes once entertained of the new national organization. But this judgment, though quite legitimate and deserved, does not go so far as to convict the Institution of complete failure. There may be good crops of papers as well as unsatisfactory ones; and an Institution is not to be condemned upon one year's production. As a visitor to the meeting tersely expressed it, "If the fare was poor, the "company was good." That is the truth. We wish we could go further, and say that the company was strong as well as of good quality; but it was not so. It is impossible to regard the Institution, at the best, as adequately representing the great national industry from which its members are drawn. It offers no indication of developing sufficiently to deserve to be so regarded. Its membership is more like that of a club, for good or for evil. Such as its character is, such it will remain as long as the society holds together. At the same time, those followers of the industry who bear no good-will towards the Institution, and would like to see it fall to pieces, would only deceive themselves if they were to fancy, from what they have read and heard of the recent meeting, that the Institution is in any imminent danger of coming to grief. This may be written of it in the Book of Fate; but the page is not yet open. Even if the Institution were to die to-morrow, it would not follow that the other organization on a national scale—The Gas Institute—would be the gainer by a man. This is a most important consideration, which must not be obscured by any individual fancy.

It is quite possible to be disappointed in the Institution without liking the Institute any the better. Those who wish well to the Institute, for the best reasons, must remember that it is dislike of this organization, rather than admiration for another, which keeps many gas men out of it. So long as the grounds of this distaste exist, the repugnance will remain. It is easy to state these grounds—far easier than to procure their removal; although the restoration of one sound, powerful, and united Technical Society for the gas industry of the United Kingdom, in place of the existing miserable division, would be the prize of success in this endeavour. The objection to the Institute, in a word, is the company it attracts, and the consequences thereof. Some men go to the Institute meetings for no legitimate object. We here purposely desire to avoid branding any order of members, or "friends" of members, by their calling, or the nature of their connection with the gas industry, with the object of fastening upon them the odium of bringing what ought to be an educational agency, and a means of honest mental and physical refreshment, into disrepute. There are black sheep in all large folds. Moreover, we are not such innocents as to believe in the fable of the wicked, designing "trader" and the spotless "professional." But what we do believe, and think it right to state openly, is that the whole atmosphere of the Institute meetings is tainted by the presence on these occasions of persons, and the sanction accorded to practices, which the right-thinking members are ready enough to privately deplore, but which they make no serious attempt to remove or prevent.

It is a question of atmosphere, rather than of constitution, or order, or mere technical working. If the Institute papers of three weeks hence turn out to be as good as those of the Institution were poor—which is more than likely—this passing circumstance will not effect anything in the direction of vindicating the organization that is able to justify itself in this regard. Men will read the papers and the discussions in our columns, and will never dream of applying for membership on this account, if they know of any other objection. It is understood that the Institute

Council have held conferences on the subject of the reunion of the industry. It is simply waste of time, money, and pains. Let the Council show that they mean to change the atmosphere of the Institute meetings—not for the sake of pleasing the fastidious taste of any "superior persons" at present outside the Society, but because they, and those who are like-minded with them, believe it is the right and proper thing to do—and the prospect of union would brighten from that very moment. We believe that some members of the Council and of the Institute are in earnest in desiring this reform; but they are timid. Others do not seek it. Time will show which party is the stronger. Meanwhile, the way of reform is not that of revolution. There is no necessity for asking any description or order of members to retire from the Institute and stay away from the meetings. If such a request were made, the unobjectionable element would accede to it, while the worst offenders would probably set it at defiance. Much might be done by limiting the privilege of attendance at the meetings by visitors strictly to those whose presence is likely to be for the good of the Institute, and by confining all other privileges as closely as possible to members. It is to be recognized that the holding of the meeting in London this year is a measure in the best interests of the Institute; and it is greatly to be hoped that those who were instrumental in getting this "thin end of the wedge" between the worthy and objectionable elements of the society, will persevere and drive it home, until the latter are split off for ever.

The Metropolitan Gas Inquiry.

At the resumed inquiry into the powers of charge of the London Gas Companies, Mr. H. E. Jones completed his evidence. It is almost an impertinence to compliment a professional man of Mr. Jones's standing upon such an every-day performance as the giving of expert evidence; this being with him a matter of ordinary business. Still, it is only fair to admit that the occasion is very extraordinary. Nobody knows what the Parliamentary Committee can do, and most people doubt whether it can do anything. In the circumstances, a very little blundering one way or another would turn the whole investigation into a farce. Parliament very wisely entertains a righteous horror of mere academic studies that cannot lead to any practical result. This inquiry is perilously near the borderline separating business from solemn trifling; but if it continues to the end on the right side, the result will be largely due to the expert witnesses. Nothing could be in better taste than Mr. Jones's replies to the various questions addressed to him that raised those delicate issues which are gradually taking shape as the sole matters of importance in this investigation. Mr. Jones did not mind being pressed to account for any differences now existing between the Commercial and South Metropolitan Companies; but beyond this exercise he would not go. After Mr. Jones came Mr. A. C. Morton, who wished to hark back to the old plan of competition in gas supply. This witness, speaking for the Corporation of the City of London, expressed the opinion that the sliding-scale and the policy of amalgamation have not redounded to the advantage of all the consumers of gas in London. He objected to the high price charged by The Gaslight and Coke Company, and thought there must be something wrong about a system which did not make it compulsory for every Metropolitan Gas Company to charge the same as the Company selling the cheapest gas. The Gaslight and Coke Company are bound to supply gas for public lighting at the South Metropolitan rate; and Mr. Morton thinks the same obligation ought to apply all round. Asked whether it was the idea that The Gaslight and Coke Company should be made to supply even at a loss, in order to keep their price down to the South Metropolitan level, the witness did not shrink from the conclusion. He is the typical "man in the street," who cannot for the life of him understand why the biggest Company should charge the highest price. Mr. Doughty followed on much the same lines. He spoke for the Vestry of St. Leonard, Shoreditch, a manufacturing parish entirely within the district of The Gaslight and Coke Company. There is naturally a great similarity of statement with witnesses of this description. The trend of the whole inquiry, so far as it has gone, is disclosed in the following colloquy between a member of the Committee (Mr. Cohen) and this witness: Question: "You know that the district north of the Thames is quite "as favourable as the south?" Answer: "More favour-"able." Question: "And therefore, as far as you are "concerned, the price in the north ought to be at least "as low as it is in the south?" Answer: "Quite so." Question: "And the fact that it is not, in your judgment "calls for an explanation, which must be afforded by the "Company supplying at the higher price?" Answer: "Yes." Here we have the gist of the whole matter.

The Judgment in the Hull Gasholder Case (Appeal).

Judgment has been given by the Appeal Court upon what is known as the Hull gasholder lawsuit. It was an action for damages for injury to adjoining property resulting from the construction of a gasholder tank, and also for an injunction to restrain the erection of a gasholder beyond a certain height. Mr. Justice North decided the case in favour of the plaintiff Jordeson; condemning the defendants (the Sutton, Southcoates, and Drypool Gas Company) in law as well as on the facts. The Company appealed. The Master of the Rolls has now upheld the judgment of the Court below. Lord Justice Rigby agrees "on the whole" that Mr. Justice North was right, but is less positive than his chief; while Lord Justice Vaughan Williams entertains opinions which differ in some respects from those of his learned brethren. Consequently, there is considerable encouragement for the supposition that the last of the case has not been heard, and that the losing side will not rest satisfied with anything less than the decision of the House of Lords. Litigation such as this is exceedingly tedious and troublesome; but it is difficult to see how it can be avoided, or, when once entered upon, arrested at any stage short of the "bitter end." The contentious points of the case are numerous, raising all sorts of subjects of the utmost gravity. The chief general interest, however, arises from the fact that, in dealing with the question of nuisance, the Lords Justices of Appeal had to construe the pertinent clauses of the Gas-Works Clauses Acts, 1847 and 1871, as well as the Company's Special Act of 1867. In so doing, there arose the old query as to whether the Company, assuming that they had committed a nuisance to their neighbours, had been acting under compulsion of their circumstances and their statutory obligations. Here is the point, as brought out by the Master of the Rolls: "If they could show any enact-"ment expressly or by necessary implication authorizing "them, in terms, to erect a gasholder at the place where "the holder in question was, and of the dimensions of "this holder, or any express or necessarily implied autho-"rity to cut through the stratum of running silt, and if "they could show that it was impossible to exercise those "clearly conferred powers without creating damage to "their neighbours, they would be protected." The remedy against carrying a gasholder to an excessive height is injunction; an award of damages not being sufficient. These are the general points. The question whether the adjoining property was damaged by the withdrawal of silt and water in the process of pumping from the tank is a purely local one, albeit serious enough for the parties. Lord Justice Vaughan Williams's judgment on this part of the case is worth reading as a statement of the law relating to the particular issue. As the case is most likely to go further, we cannot express an opinion respecting the merits either way.

The Bradford Corporation and the Partition of the Suburban Gas Undertakings.

The Bradford Corporation Extension Bill has been in Committee; the clauses proposing to appropriate parts of the undertakings of the outlying Gas Companies serving the affected areas being strongly opposed by the Companies. These municipal extension operations invariably run the same course. It is impossible to set a permanent boundary to the district of a prosperous Municipality. Every extension constitutes an argument for more; and the once independent suburbs are drawn one after another into the Municipal fold. Water and gas are usually cheaper inside the borough; and consumers living on or near the boundary always grumble when they see one scale of prices prevailing on one side of a street, and another in operation over the way. At the same time, the circumstances of outlying Gas Companies should in fairness be considered on every possible ground. In such a case as that of Bradford, the surrounding Gas Companies were formed to supply a public need when there was no prospect of the borough extending so

far. They actually serve districts very much more extensive than the areas proposed to be incorporated in the borough. If Bradford has adopted the policy of carrying its gas supply wherever it pushes its borough limits, this entails a serious amount of partition of the outlying gas undertakings, which is a much graver matter for them, and also for the remaining consumers, than absolute purchase right out. For the moment, Parliament has shrunk from making this severance compulsory as regards the Gas Companies affected by the Bradford Bill. The Companies will therefore retain their rights over the districts taken into the municipal limits. We do not suppose for a moment that the matter will end here. The Corporation and the outlying Gas Companies will have to come to terms; and they will do this with greater safety for all the interests involved for having to approach the problem upon the same footing. The difficulty of "seeing fair" between all the parties to a severance of a gas undertaking is very great. There is no precedent for a valuation of this kind. Small portions of gas supply areas have been taken from one undertaking and given to another; but we cannot recall a single instance of any such operation where the partition was so considerable as to sensibly alter the prospects of the remaining portion. The fact of Bradford proposing to take powers to compulsorily procure such a severance under the Arbitration Act is, it must be said, one more proof that Municipalities are not to be trusted to deal fairly when once they have become imbued with the trading spirit. It was recently argued in these columns that English Municipal Corporations are standing at the present time at the parting of the ways between commerce and administration. If Parliament is ever to be induced to entrust to the more important local governing bodies more of the powers of legislating upon details which now fall to the Committees of the two Houses, it will have to be shown that the process of devolution is safe. Such examples as that of Bradford do not encourage this view. Municipal extension for the purposes of local self-government is one thing that might perhaps be left to the localities to settle for themselves; but when any operation of the kind entails the driving of more customers into the municipal shop—to say nothing of the "robbery" of the suburban trader—then it is a matter that cannot be so simply dealt with. The Pudsey and Shipley Gas Companies are to be congratulated upon their successful resistance to the proposed act of vivisection in the presumed interest of Bradford. When the operation comes into notice again, the suggestion will require to be accompanied by a scheme for its proper execution.

Burdens of a Gas Company Working Under a Silver Currency.

The story which the Chairman of the Singapore Gas Company (Mr. Samuel Spencer) told the shareholders at their meeting last Thursday is not one which will have a beneficial influence in promoting the investment of English money in colonial enterprises where the standard currency is in silver. The Company have reached the crisis in their existence, which existence has not borne the good fruit confidently expected by those who placed their money in the concern 37 years ago. The profits that have been available for distribution have only been equal to an average dividend of 4¼ per cent., which is a miserably inadequate return for an investment of this class. For some years the shareholders did not receive any dividend at all; and latterly they have been dividing even less than the percentage named. The result is that they now find themselves, after long years of waiting, in possession of shares the real worth of which is only about three-fifths of their nominal value. Mr. Spencer shows in his address what might have been done with the money had it remained in this country; and his remarks will find many sympathetic readers. For the throttling of the hoped-for prosperity, the terrible depreciation of silver has been primarily responsible. The dollar, which up to seven years ago averaged 3s. 3d. to 3s. 6d. in value, has dropped to something below 2s.; and the effect of this is seen in the accounts. Against a total income last year of £31,730, no less than £12,112 is debited under that hideous item "loss on exchange," leaving the Company, after paying working and other expenses, with only £3560 of profit. And such as it is, the shareholders have to thank the present Board for even this modicum of comfort. A very few years ago, under previous administration, the Company were on the verge of bankruptcy; but, by capable management of the finances, they are now out of debt, are paying a small dividend, and have a moderate balance in hand. But time has brought the concern to its critical point. The Company are at the end of their contract with the Municipality, and are at present working under a temporary arrangement. The position for the Company is anything but an enviable one. The Municipality are apparently wavering between three courses—the purchase of the works, the extension of the contract with the Company, and the institution of a competing system of illumination. The adoption of the last-named course would, it seems to us, be the height of folly on the part of the Municipality, as the experience of the Gas Company shows that Singapore is one of the most unpromising places in the world for the profitable running of a second lighting venture. Then, in regard to the purchase of the existing gas-works, the Directors have, at the request of the Municipality, named £55,000 as the price they are prepared to accept for their property, which is between £15,000 and £16,000 less than the capital expended, and is only equivalent to 15½ years' purchase of last year's profits. Compared with the terms of purchase obtaining in this country, the Company's demand is, without question, a modest one, and for the Municipality it bears the appearance of being an exceptionally good bargain. Any way, the ill-requited services of the Gas Company to Singapore deserve consideration; and, in common fairness, the Municipality should, without further delay, either determine to purchase the undertaking at the price named, or give the Company a prolongation of their contract.

The Non-Explosibility of Gasholders.

In noticing in these columns last week the disastrous explosion at St. Helens, the results of which are strikingly shown in the photographs we are able to reproduce to-day, we took the opportunity to confute once more the assertion that gasholders in a town are a standing source of danger from their liability to explode. Of course, our readers do not require to be reassured on this established principle; and the matter is only again referred to in order to bring to their recollection an excellent case in point. In the "Journal" for Aug. 1, 1871, it was recorded that during the bombardment of Paris the Governor of the city feared that the holders at the Villette station of the Gas Company would endanger the fortifications. He was assured that there was not the smallest risk—that, in the event of a projectile penetrating a holder and firing the gas, the latter would simply burn itself out as a jet of flame. Curiously enough, a shell shortly afterwards pierced the holder at Ivry, and ignited the gas. There was an enormous flare for about eight minutes, and then all was over. But at La Villette a shell penetrated a holder when it was full of gas, and actually burst inside without setting fire to it; and there was a similar occurrence at Vaugirard. These facts, which are specially noteworthy at the present juncture, were recently recalled to mind by the perusal of the interesting and exhaustive address delivered by Mr. Charles E. Munroe, the President of the American Chemical Society, at the New York meeting of that body. Mr. Munroe was dealing with the subject of explosions caused by commonly occurring substances; and he characterized as "vulgar" the opinion that illuminating gas is an explosive. Of course, every chemist knows perfectly well that it is not, *per se*, and that it cannot be made to ignite unless in contact with air or other supporter of combustion. But while the chemist and the gas manager are thoroughly cognizant of this scientific truth, and are able to demonstrate it, it is highly satisfactory to be in a position to adduce results of experience on a large scale so much to the point as those above cited.

The Endowment of the Birmingham University.

It is a matter of national thankfulness that the necessary minimum endowment of a quarter of a million sterling for starting the Birmingham University has been more than attained. This is one of the most satisfactory proofs ever given of the advantages derived by a modern State from the existence of rich men. The endowment fund has up to the present time been provided by comparatively few people; and the Canvassing Committee now desire to see whether a general appeal to the citizens of Birmingham will meet with a worthy response. Candidly, we do not know why the common person should put his hand into his pocket for the purpose. Universities are for the rich to provide; and in this category the great organized

industries of the country should be included. We trust it is not a vain hope that the gas industry of the United Kingdom will be moved to recognize in some substantial manner the benefits derivable from the highest kind of teaching, such as a modern University ought to be able to provide for those who are capable of taking advantage of it. The address of the President of the Institution of Gas Engineers was eloquent upon this head; and it would be a pity for his words of wisdom in this regard to be thrown away. A University education, like all other tools, is only of use in the proper hands, and for the proper purpose. It is always sad to read, as one frequently does in books of travel and the like, of Rugby boys and Cambridge men being found driving bullock teams in back settlements, and so forth. Such utter waste is expressed in these stories of careers missed, advantages lost, and cleverness gone astray. Let us hope that the new Birmingham University, when it comes into being, will not fail of its undoubted opportunity. The old Universities were places of sound useful learning in their early days. When a competent knowledge of the Latin tongue was the first necessity for a man of the great world, and when the only science was locked up in Greek, men who wanted to get on had to equip themselves with these accomplishments. Now we want something different. The best of educations cannot be too good for young men entering on a career of scientific and technical research, development, and application. For this reason, it seems self-evident that such an institution as the Birmingham University promises to be is worthy of the support and countenance of all masters of existing national arts and industries.

WATER AND SANITARY AFFAIRS.

WHATEVER protestations may be made on the subject, it is practically demonstrated that, in some way or other, the influence of the London County Council, or rather of the Progressive portion of it, was felt in the Select Committee of the House of Lords when that tribunal was dealing with the Government Bill for effecting intercommunication between the Metropolitan water systems. We have already commented upon the extraordinary conduct of that Committee in introducing a sinking-fund clause into the Bill, contrary to the recommendation of the Royal Commission and the repeated decisions of the House of Commons. When the House of Lords went into Committee on the amended Bill last Tuesday, Lord Ribblesdale, as Chairman of the Select Committee, explained that the clause was inserted with the "strong concurrence" of the County Council and the Corporation of the City. Respecting the County Council there need be no doubt that the statement is correct. But Lord Ribblesdale argued as if the wishes of these authorities were to be regarded as overriding all the conclusions of the Royal Commission, Her Majesty's Government, and the House of Commons. In his opinion, the County Council and the Corporation were the best judges with regard to "this great water question." If anything more was wanted, it was to be found in the judgment of the Select Committee presided over by his Lordship. But there was the odd or "mysterious" circumstance that Lord Tweedmouth interposed his presence at the sitting of the Select Committee, remaining—as his Lordship acknowledged—for an hour and twenty minutes. It was suggested that the Committee had been placed under some "mesmeric" influence, by which they were induced to sacrifice their independent judgment on the subject before them. We might suggest that they were hypnotized, so that they represented somebody else instead of themselves So unaccountable was the conduct of Lord Ribblesdale's Committee, and so keen were some of the criticisms which it excited in the course of the recent debate, that the case threatened to drift into the mist of a Dreyfus *affaire;* and Lord Salisbury found himself tempted to indulge in some humorous remarks founded on an analogy with the secret *dossier*—saying he was "almost inclined to regard the "noble Lord opposite (Lord Tweedmouth) as part of the "general staff of the London County Council." The House was highly amused; and Lord Salisbury was still humorous, though correct, when he finished by saying that the Bill under consideration was not a Water Bill at all, as it did not propose to raise capital to provide water. Hence it was not touched by the precedents which had been cited. The argument was thus clinched in favour of the amendment which had previously been moved by Lord James of Hereford, excluding the operation of the sinking fund. On a division, the amendment was carried by a thoroughly decisive majority. The debate over this question was one of very considerable warmth, leading to something nearly amounting to a "scene" in their Lordships' House. The extent to which the Progressives push their hostility to the Water Companies has long exceeded all reasonable bounds, and has at last betrayed a Select Committee of the House of Lords into a false position, as paying deference to the County Council where the Legislature ought to be supreme. A last shot was fired at the Bill on Thursday when the Lords proceeded to consider the amendments; the opposition taking the form of a limit on the amount of capital to be raised for the purposes of the Act. Earl Carrington, who moved an amendment to this effect, was reminded by Lord James of Hereford that the full expenditure authorized by the Bill could only take place in cases of great emergency. The Earl made a strange reply; saying that emergency was a loophole for great expenditure, which the ratepayers of London wished to see avoided. Cries of "Order" ensued, and the amendment was negatived without a division; the Bill being subsequently read the third time and passed. The next day the Lords' amendments were considered in the Commons, and agreed to.

Mr. Boulnois, M.P., when addressing the half-yearly meeting of the West Middlesex Water Company last week, showed in a very striking manner how persistently the County Council seek to embarrass and injure the Metropolitan Water Companies, regardless of any damage which might result to the public interests. When the Bill of the West Middlesex Company was passing through the House of Commons the other day, it was declared, at the instance of the County Council, that there was no necessity to grant the Company any power to draw a further supply, even of a temporary nature, from the Thames. This was said in defiance of the fact that the Royal Commission had stated in their report that no intercommunication scheme could be rendered fully effective unless the West Middlesex Company, together with the Grand Junction and Lambeth Companies, also obtained such power. The County Council give every indication that they would like to see the intercommunication scheme entirely sacrificed, whatever risk might beset London and its outlying parts in consequence As this untoward purpose cannot be accomplished, the Council seek gratification in laying some financial burden on the Companies. The sinking-fund clause affords a ready handle for this purpose, though the Council have failed to get the clause finally inserted in the intercommunication Bill of the Government. It was explained by Mr. Boulnois, in his speech to the West Middlesex proprietors, that the sinking-fund clause had its birth in 1886, when the purchase of the water undertakings was thought to be imminent. Once brought into existence, this mischievous clause has been applied to every Bill the Metropolitan Water Companies have since brought forward, including the present West Middlesex Bill, where it happens that the blow aimed at the Company will only hit the consumers. The shareholders will get their 10 per cent. dividend; but those who pay for the supply will have to go short in their rebate. Altogether, Mr. Boulnois made an excellent address, which will amply repay careful perusal in the report given in another part of the "JOURNAL."

The Gas Undertakings Returns.—In the House of Commons last Tuesday, orders were made for the usual returns relating to all the authorized gas undertakings in the United Kingdom—in the case of those owned by Local Authorities for the year ending the 25th of March last, and in the case of the Companies' undertakings for the year ending Dec. 31, 1898. Last year these orders were not made till the 8th of August.

Societe Technique du Gaz en France.—The annual congress of this Society will be held in Paris from the 20th to the 22nd of June, under the presidency of M. Vautier. The usual meeting-place when the members hold their congress in the capital—the Society of Civil Engineers—will this year be changed; and the business will be transacted in the Salle Charras, in the street of that name, which runs from the Rue de Provence, in which the offices of the Society are situated, to the Boulevard Haussmann. The order of proceedings will be very much as usual. On the evening of the first day, there will be a subscription banquet at the Hôtel Continental; and the afternoon of the second day will be set apart for a visit to the works in progress for the Exhibition next year.

INSTITUTION OF GAS ENGINEERS.

Mr. F. D. Marshall (Copenhagen), President.

PAPERS AND DISCUSSIONS.

(*Concluded from page* 1287.)

COKE-HANDLING PLANT.

By T. Holgate, of Halifax.

The author has had occasion to consider the suitability of various forms of machinery for dealing with the coke from an existing retort-house, and also from one now in course of erection at Halifax; and he hopes that a record of his experience and of the information thus compiled may prove the basis of a useful discussion. The subject is taken to include the quenching, the conveyance from the mouths of the retorts, the screening, sizing, washing, storing, and delivery to consumers; and the author proposes to refer to the features which present themselves under these several headings, and consider how the various forms of plant meet the necessities in each case.

Quenching.—If coke is removed by side-tipping waggons, then a good supply of water is needed, as well as a distributor which will deliver a fairly equal shower of water over the area of the waggon. Unless this is the case, some of the coke will be insufficiently cooled, while other portions will be exceedingly wet. In one case, where these trucks were in use (presumably holding about 10 cwt. of coke), the engineer informed the author that their use was being discontinued on account of this difficulty. In my own experience of trucks holding 6 cwt. of coke, the equal cooling of it has not been found easy. At Halifax the coke is received from the horizontal retorts into a hopper having its mouth at the retort-house floor-level, and having at the bottom a door. If the cokeman has an insufficient supply of trucks, he receives the coke into the hopper; otherwise he allows the coke to slide through the hopper into the truck, and quenches there. If the operation is not well done by the first-named method, then distortion of the hopper door takes place. In either case a good supply of water is necessary; the advantages being in favour of quenching in the truck. The efficiency of quenching in conveyors appears to be much better in the scraper form than in the plate. In the latter the water escapes below the plate, while in the former it is retained in the trough in contact with the coke. Where all the coke is passed through screens, it appears that less water need be used than when it is delivered without such an intermediary.

Conveying from the Retorts.—The most suitable method for each case must depend primarily upon the relation in position, level, and area of the coke-yard to the retort-house.

The following are to a larger or smaller extent in use:—

(A) Removal by means of trucks worked by an endless rope, locomotive, horses, &c., upon gauges from 2 feet to 4 ft. 8½ in.

(B) Removal by means of conveyors.

(C) Combinations of A or B with means of elevating —(*e.g.*) inclined conveyors, bucket elevators, crane lifting by grab or bucket.

Method A has been adopted at Halifax (see pp. 1350-51) for dealing with the coke from 180 mouthpieces, and was selected because of the contiguity of the railway viaduct to the retort-house preventing the use of conveyors which must run in straight lines. The use of a wire rope gives elasticity in plan as well as in elevation to a greater degree than would the use of locomotives, with the advantage of a lighter set of girders and standards to support the tramway. The haulage rope is ⅝-inch diameter, 300 yards long, and runs at ¾ mile per hour. The tension is maintained by a weight of 6 cwt. suspended from a pulley 4 ft. 6 in. diameter (over all). The power is obtained from a shaft in the adjacent workshop, and the driving-pulley draws the rope from under the tramway through guide-pulleys. The pulleys and rollers are of cast steel, selected from the catalogue of Hadfield's Steel Foundry Company, Limited. The rope travels from G to L, through the tension gear (placed under the tramway) and from L to the driving pulley, and from that back to M, and thence to E, completing the circuit to G, as shown on the block plan. It will be noticed that at L the trucks must be disconnected, and at M reconnected to the haulage rope. From G to H the ascent is 1 in 14, from H to S level; and from S to E the descent is 1 in 12·63. For safety, the inclined portions of the tramway are fitted on the ascent with automatic stops at 6-feet centres, to prevent the trucks running away; and on the descent a brake in the form of a long flat bar 2 inches by ½ inch, standing 6 inches above the tramway, is required.

The trucks used weigh about 7¾ cwt. The frame is 5 ft. 6 in. long, the body 3 ft. 6 in. long by 3 ft. 9 in. broad at the top, and 2 ft. 4 in. deep. The carrying capacity is 20 cubic feet—equal to 6 cwt. of coke. The trucks are connected in pairs by a piece of chain. The front one is secured by a clip to the wire rope. It has been designed and made as the result of many tests, and to meet the trying conditions of this installation. The clip must be easy of attachment to the rope; it must hold firmly in ascending and descending inclines; it must pass easily the guide-pulleys on the tramway; and it must, by its method of connection to the truck, not allow the latter to overrun the clip when descending. It must also be arranged to release automatically when the truck reaches the screens or the place L where the rope passes under the tramway. By fixing at these points a 1⅛-inch diameter horizontal bar 3 ft. 9 in. long at 9½ inches above the tramway, this is satisfactorily done. The adhesion of clip to rope is diminished as the latter wears away; and to compensate for this, in the Halifax clip, the wedge action is provided with an adjustable slide; and for still further wear the jaws of the clip have renewable bushes.

The installations at Old Kent Road and Crystal Palace Gas-Works of rope-haulage machinery are very instructive, and should be seen by any engineer contemplating this method. The general arrangements are very similar; and the following particulars respecting the South Metropolitan Gas Company's Nos. 1, 2, and 3 retort-houses at Old Kent Road have been furnished by Mr. C. C. Carpenter.

The arrangement comprises a sloping shoot, upon which the coke falls when drawn from the retort; and it is there watered by a hose-pipe from the coke-hole. The front, or tail of the shoot, is fitted with a hinged grating which allows the surplus water to run away. The grating is then opened by means of a lever, and the quenched coke allowed to fall into trucks holding about 6 cwt. each. These trucks, which are five in number, are connected to an endless wire rope, and run on rails of 14½-inch gauge through the coke-hole up an incline to an elevated railway, where they shoot towards either side on to the ground below. An electric bell indicates to the man who controls the levers when to start and stop. The endless wire rope is driven by a 12-horse power gas-engine, and put in gear by double fast-and-loose pulleys for travelling forward or backward. The coke required for charging the furnaces is run direct into the furnaces by means of a shoot. The coal carbonized in 24 hours is: 30 beds of 10 × 2 = 600 mouthpieces = 367 tons. The cost of labour is 4·3d. per ton of coal carbonized, and includes quenching and delivering the coke upon a heap 10 to 18 feet high and 172 feet long; the coke being drawn from each side of the retort-benches 313 feet long. At Halifax, the cost in wages for quenching, removing to the store heap, or screening into hoppers is equal to 4d. per ton of coal carbonized. The retorts number ten beds of throughs, nine in each arch—that is, 180 mouthpieces—with six-hour charges.

The points to be emphasized in connection with rope haulage are as follows:—

1.—The adoption of a convenient method of automatically tightening the rope.

2.—The use of curves upon the tramway and rope circuit of the largest possible radius. At Halifax, the minimum radius is 15 feet, and upon this part the guide-pulleys are required at 1 ft. 3 in. centres.

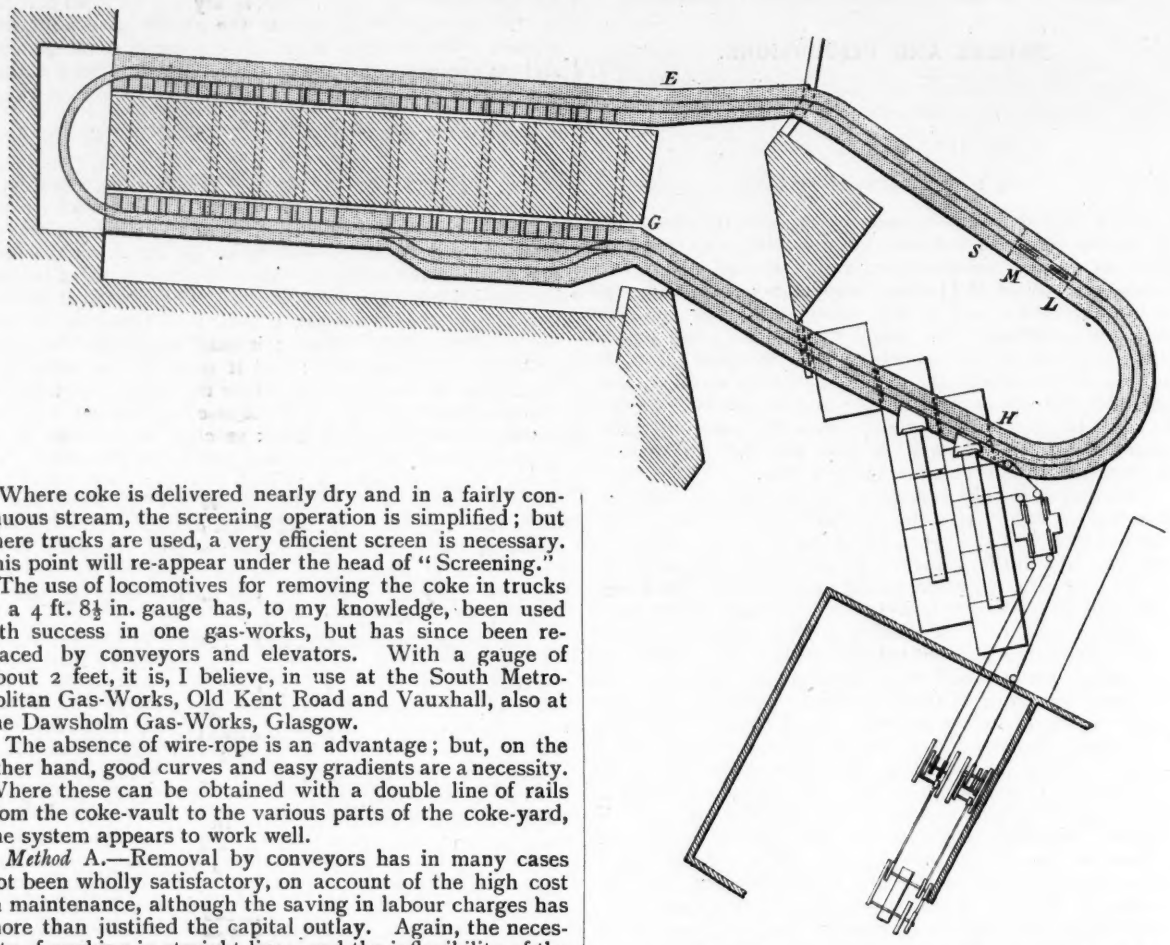
3.—The use of fleeting and guide pulleys of large diameter, and, where grooved, the grooves to be turned in a lathe to the exact curvature of the circumference of the rope.

4.—The life of the rope depends upon the maintenance of the splice; and this in turn depends upon the flexibility of the rope, the angle through which it is bent on its circuit, and the number of times per hour that the angle is reproduced.

5.—The use of a screen which is effective in dealing with large quantities of coke received irregularly.

COKE-CONVEYING PLANT AT THE HALIFAX CORPORATION GAS-WORKS.

PLAN OF COKE TRAMWAY.



Where coke is delivered nearly dry and in a fairly continuous stream, the screening operation is simplified; but where trucks are used, a very efficient screen is necessary. This point will re-appear under the head of "Screening."

The use of locomotives for removing the coke in trucks on a 4 ft. 8½ in. gauge has, to my knowledge, been used with success in one gas-works, but has since been replaced by conveyors and elevators. With a gauge of about 2 feet, it is, I believe, in use at the South Metropolitan Gas-Works, Old Kent Road and Vauxhall, also at the Dawsholm Gas-Works, Glasgow.

The absence of wire-rope is an advantage; but, on the other hand, good curves and easy gradients are a necessity. Where these can be obtained with a double line of rails from the coke-vault to the various parts of the coke-yard, the system appears to work well.

Method A.—Removal by conveyors has in many cases not been wholly satisfactory, on account of the high cost in maintenance, although the saving in labour charges has more than justified the capital outlay. Again, the necessity of working in straight lines, and the inflexibility of the arrangement, have also retarded their adoption. It is claimed by the makers of one kind of conveyor that will be hereafter described that a slow curve can be traversed, because the path is described by rollers placed outside the trough; and, further, by the use at the terminals of the conveyor of a rotary section, the flexibility is greatly increased. The cost in wages appears to be less with a good conveyor than with trucks, buckets, or grabs.

Pan or plate conveyors, however suitable for dealing with coal, are not so for hot coke. The presence of tar, coke grit, or water for quenching, conspires against the durability of the plates, the chain, the bearings, sprocket-wheels, or other moving parts; and to overcome these adverse elements, the thickness of material has to be increased, with the result that the power required has been unduly augmented. The wear and tear on plates, chains, and pins for the same have received attention; so that quite a number of varieties in the unit of construction are available.

The place where the hot-coke conveyor is most efficient appears to be with its upper surface level with the retort-house floor; but there are varying conditions, such as the presence of furnace shoots, which may require the conveyor to be placed under the floor, with light shoots directing the coke thereto. In Mr. Wild's conveyor this use of the shoots enables the rollers and other wearing parts to be kept out of contact with the hot coke, water, or tar. The return chain is now often placed above the highest tier of retorts, supported by rollers on a series of brackets and tie-rods; in this way giving an easy curve for the change of direction at each end, and also keeping the chain comparatively dry. This method may be replaced by an under return chain supported on a path upheld by the same frame as the conveyor trough. In some cases on the Continent the return chain of the De Brouwer conveyor has been used to take ashes and clinker from the furnaces, and deposit them in an elevated bunker.*

* See "JOURNAL," Vol. LXVII., p. 23; and Vol. LXXI., pp. 127, 1469.

In most of the push-plate conveyors, the scraper does not bear upon the trough, and this secures quiet working, with the wear due to weight only acting upon the rollers or sliding contacts. It is very noticeable, when watching these conveyors, that the coke is taken bodily forward without much distribution; but, being of relatively small depth, every part may be quenched by the water-sprays placed at intervals over the trough.

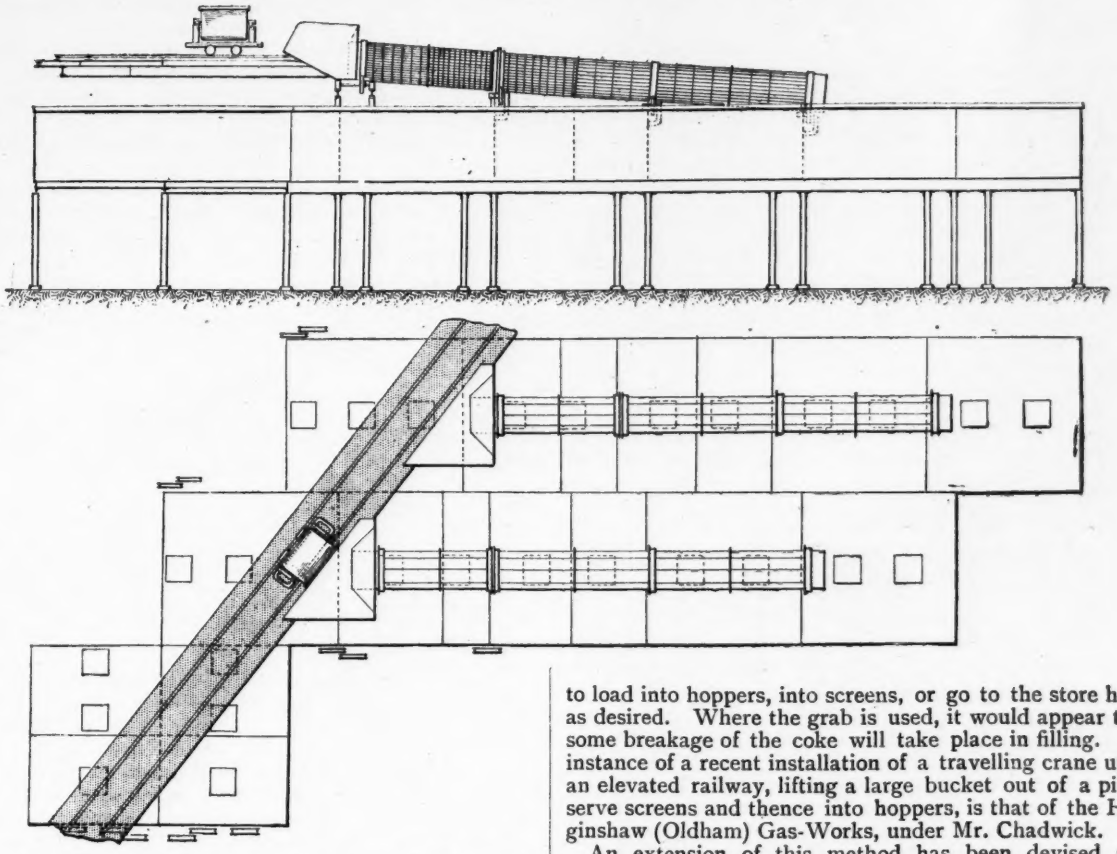
Elevating.—The makers of the De Brouwer conveyor state that in Belgium their appliances are effective in carrying coke up inclines of 30°, and that, if found necessary, this angle could be increased somewhat before the coke would cease to be carried forward. Mr. Wild, by using a deep scraper, claims to lift up slopes of 45°. This method of elevating is very convenient, owing to the absence of difficulties in feeding. The discharge may also be made at any part of the height. The dead weight moved is small; and the wear and tear should not prove expensive.

Bucket elevators have the advantage over cranes in giving more continuous delivery, resulting in less cost for labour, especially where the point of delivery is constant. It is necessary that the feeding arrangements at the boot, or better into the buckets, should be good. The chain to which the buckets are attached must be of uniform pitch, must not wear or stretch unduly, must have pins and bushes that can readily be renewed, or be so hard as to wear out but slowly.

The weight of the buckets, the chain and the coke, with the inclination, will determine the stress to be borne by each link, and in choosing the type a material of uniform strength should be found. The chain perhaps most extensively used hitherto has been Ley's bushed chain, made of "black heart" malleable cast iron, and having a safe working strength of 2500 lbs. for the 6-inch pitch, pattern No. 600, which the makers state is about one-tenth of the breaking strength. The wear of this chain is stated to be very much less when the material employed is Hadfield's manganese cast-steel links, fitted with forged manganese

COKE-CONVEYING PLANT AT THE HALIFAX CORPORATION GAS-WORKS.

COKE HOPPERS AND SCREENS.



steel pins. The wear of the sprocket-wheels is very much reduced by fixing a roller upon the pin joining the links, as devised by our Past-President, Mr. Charles Hunt.

It would appear that the ultimate tensile strength of manganese steel is twice that of malleable cast iron; but the elastic limit of the former is comparatively low. It would not, therefore, be advisable to reduce the sectional area (irrespective of the difficulties in casting of steel) of the manganese steel links, as a permanent set would be induced, such as to cause a jerky action at the sprocket-wheel.

For any important installation of elevators it would be desirable to have the links proposed to be employed tested, and only use them for stresses well within the elastic limit. It is further desirable to remember that manganese steel is not recommended by its makers for use where the links are liable to become heated, as the strength rapidly diminishes as the temperature is raised. Elevators are best driven from the top with a belt, so that, in case of unusual strain, slipping may take place rather than breakage.

Buckets used for coke should have strengthened lips. They should have rollers fixed to axles; the rollers running upon the angle-iron forming the framework of the elevator on the upward and downward paths. They should be placed near to each other, with the intervening space covered by a light plate, so as to keep all dust from the links and other moving parts.

The shape of buckets and the angle of the elevator should be arranged to give a clean discharge without further devices. The capacity of the elevator must be quite equal to what the conveyor feeding it can ever bring to it; otherwise serious trouble from jamming in the boot may result. And, again, the conveyor at the discharge end of the elevator must be quite equal to the work assigned to it. These conditions must, of course, be designed to suit the conditions of discharging from the retorts, which might be almost continuous or very intermittent.

In a number of gas-works, the coke is elevated in grabs or in large skips fitted with automatic doors, raised by means of cranes of various types. In some cases, a locomotive steam crane travels upon an elevated railway, preferably of a wide gauge (up to 8 feet). The crane has motions which enable it to cover a series of circles sufficient to load into hoppers, into screens, or go to the store heap as desired. Where the grab is used, it would appear that some breakage of the coke will take place in filling. An instance of a recent installation of a travelling crane upon an elevated railway, lifting a large bucket out of a pit to serve screens and thence into hoppers, is that of the Higginshaw (Oldham) Gas-Works, under Mr. Chadwick.

An extension of this method has been devised and patented by Mr. Woodward, of Manchester. He places a crane upon a frame or carriage, which rotates upon a path of girders. The crane can also rotate upon the carriage; and the combination of movements enables a large area of ground to be covered to a considerable height with coke, or hoppers may be used from which carts or bags may be filled.

As an instance of the cost of providing a steam crane for dealing with 60 tons of coke per hour, the following particulars will serve: The crane jib describes a complete circle of 120 feet diameter; maximum rake, 120 feet; minimum rake, 32 feet; weight of coke lifted each time, 3 tons; coke skips, 290 cubic feet capacity, with hinged bottom doors (price about £30); total weight of crane, 30 tons (ballast, 12 tons); approximate price, excluding foundations and steam supply from works boilers, £1000.

Perhaps the most suitable form of crane is the cantilever, as employed by Mr. H. Hack at the Saltley Gas-Works.* Coke from the terminus of the pan conveyor falls into a bucket placed in a pit. The bucket holds 2 tons, and is lifted by hydraulic power, traversed along the cantilever, or rotated so as to be deposited at the store heap into screens for boats, for railway trucks, or for other receptacles for yard sale.

Screening.—The form of screen most suitable appears to depend upon the number of sizes of coke required, the height and length available, the intermittent or continuous stream of material, and the arrangements at the hoppers or other receptacles. It is to fixed screens driven by power that the following remarks are intended to apply.

Where shaking screens are used—as, for instance, at the Gaythorn Gas-Works and at many collieries—flat plates with round holes closely spaced appear to be effective, furnishing a nut or cobble of very uniform cubical content. The flat plates are placed at a slight inclination; and the forward movement of the coal or coke, and the removal of the dust, are obtained by a reciprocating motion which is quick in a forward direction and slow in returning.

Another form of inclined screen is in use at the Saltley Gas-Works. The coke is traversed by a number of chains

* This arrangement was illustrated in the "JOURNAL" for July 11, 1893, pp. 83-85.

placed in parallel lines; and the spaces over which the coke is thus brought are made wider or narrower according to the width of the bars placed between the adjacent chains.

Rotary screens appear to have the advantage in simplicity of their moving parts, and in general arrangement are capable of considerable modification to suit individual requirements. For coal, the Humboldt Engineering Company, Limited, use a number of cylinders (as many as five) placed concentrically; the spaces between each adjacent cylinder being occupied by spirals which deliver the various sizes into shoots. In this way the largest material is first removed, preserving it from breakage. One of these compound screens, to deal with 100 tons of coal per hour, weighs 11½ tons, and measures 8 ft. 3 in. in length by 10 ft. 6 in. diameter. Similar rotary screens, but without the spirals referred to, are made by many colliery engineers; and to some extent they are used in gas-works for removing dust and for sorting breeze. They appear to be effective; but where coke is the material screened, and the wear and tear great, the complexity of numerous concentric cylinders is a disadvantage.

Where coke is supplied dry and in regular quantities, a plate periphery with round holes will be effective. But if these conditions do not obtain, a wirework periphery with square or oblong holes will be more effective in removing the dust and small sizes; and better still, if very exact sizing is not required, is a periphery built up of round bars secured to a framework in such a way as to be easily renewed. The method of driving may be by internal shaft, or better by external spur-wheel and pinion, or by wire rope, chain, belt, &c. The screen should be balanced, and the cast-iron parts rotating upon the supporting cast-steel rollers should be turned up true.

To ascertain the relative efficiencies of two types of screens when fed by coke from trucks holding 6 cwt., the following tests were made at the Halifax Gas-Works:—

1.—Screen with plate periphery, 34 ft. 3 in. long by 2 ft. 9 in. diameter. Inclination, 1 in 8½; speed, 24 revolutions per minute.

	Length of Plates. ft. in.	Passed Through. Per Cent.	
½-inch holes at 1¼-inch centres . .	9 0	2·5	dust.
1 " 2 " . .	10 3	16·1	nearly all dust.
1½ " 3 " . .	10 3	16·4	containing 16 per cent. small.
Through end of screen	..	65·0	not free from dust.
		100·0	

2.—Screen with strong wirework and spaces formed by round bars, 23 ft. 3 in. long by 2 ft. 9 in. diameter. Inclination, 1 in 15; speed, 24 revolutions per minute.

	Length of Section. ft. in.	Passed Through. Per Cent.	
½-inch bars and ½-inch spaces . .	4 7	26·0	dust.
1⅛-inch by 1½-inch mesh	4 7	18·0	of which 6 per cent. was small.
1¾-inch spaces	5 4	30·8	clean.
2¼ "	5 4	20·5	"
Through end of screen	..	4·7	"
		100·0	

The screen adopted at Halifax is 2 ft. 9 in. diameter by 35 feet long, and is driven by means of a ½-inch rope at 17 revolutions per minute. It is supported upon four pairs of cast-steel rollers, 14 inches in diameter; one pair placed nearly at each extremity, and the others at distances of 10 ft. 6 in. apart. The framework consists of four cast-iron rings, 5 inches wide by about 3 ft. 4 in. diameter outside, which rotate upon the aforesaid rollers; and in the second one is combined the fleeting pulley upon which the wire rope is placed. Intermediate to these castings are cast-steel rings 1 inch thick, 2 ft. 6 in. inside diameter, and 3 ft. 4½ in. outside diameter. Connecting each of these rings with its adjacent casting are placed eight 1¼-inch wrought-iron rods with shoulders upon each screwed 1¼-inch Whitworth thread. The cast-iron rings, the steel rings, and the rods are all machined in the lathe to exact dimensions, and when screwed up they form a true circle, balanced, and rotating with the minimum of power. The spaces between each ring (approximately 5 feet long) are filled in with renewable bars of wirework mesh as desired. The square mesh gives more exact sizes; but the wire is not so durable as the bars.

Section No. 1 is fitted with ⅜-inch round bars, with ⅜-inch spaces, in segments such that eight make up the circumference. These segments are each secured to the rings by three ½-inch bolts, and are thus easily replaced. Section No. 2 has a wirework mesh ¾ inch square. The wire used is No. 7, 0·176 inch in diameter. This mesh is fitted inside the framework, and is likewise easily renewed. Section No. 3 is like No. 2; but the mesh is 1⅛ inch square, made of No. 4 wire, 0·232 inch diameter. Section No. 4 is like No. 1; but the round bars are ½ inch, and the spaces 1¼ inch. Section No. 5 is also like No. 1; but the round bars are ½ inch, and the spaces 1⅜ inch. Section No. 6 is like No. 1; but the round bars are ½ inch, and the spaces 1¾ inch.

Sizing.—In some localities, coke of small but uniform dimensions is much sought after; and it appears that this may usually be met by screening without the intermediary of a breaker. Whether the cubes so obtained by sorting only are as good fuel as those obtained by breaking the larger pieces, the author is unable to say; but they can be obtained more cheaply, accompanied by a lessened production of dust. If coke is to be washed, it is advantageous to have it prepared to uniform sizes. This is very marked in washers having mechanical pulsations. Coke from retorts charged with coal, mechanically broken, to be handled by West's manual machine, was passed through a screen as last described with the following results:—

	Per Cent.	
Passed through ⅜-inch	13·85	shale, dust, and smalls.
" ¾ " square mesh . .	8·30	containing 30 per cent. under 7/16 inch square.
" 1¼ " " . .	15·39	free from dust.
" 1¼ " spaces . . .	24·00	"
" 1½ " " . . .	12·00	"
" 1¾ " " . . .	11·08	"
Over end of screen	15·38	"
	100·00	

Washing.—The preparation of small sizes of coke for smiths fires is work that is well worth doing; but it requires careful attention to detail. Washing by hand riddle seems to be the method adopted in gas-works; but it does not appear impossible to devise a machine which shall do this work efficiently, and at small cost for labour and maintenance. The price of washed coke should, however, always be considerably higher than the unwashed material—not less than 50 per cent.—as the proportion of inferior material removed is often high; and this portion may have but small commercial value. Hand washing is stated to cost 2s. per ton in labour and incidentals.

For mechanical arrangements in washing, the author has endeavoured to learn the experience of those who have dealt with coal upon a large scale, and the following is the information thus gained.

In England, quite a variety of forms exist, many of native origin; and two that are well known—the Luhrig and the Humboldt—are of Continental growth. The distinguished feature of the two last named is the use of felspar as the medium of separating the heavy parts from the lighter ones in a "bash," or jigger. This vessel receives coal (of uniform dimensions from screens) and water. By the oscillation of a piston acting upon the stream of water in which the coal is flowing over a bed of felspar, the dirt passes through the latter, and is automatically removed, while the coal is elevated into bunkers for drying and loading. The felspar is intermediate in gravity between the good coal and the dirt; and such is the efficiency of the system, that the makers of the plant undertake to remove all free ash not exceeding 1 per cent., to leave not more than 1 per cent. of coal in the dirt they remove, and to do this at a cost of not exceeding 1d. per ton for labour, or 3d. per ton all charges, including that of interest on capital.

The washer which has been recommended to the author by a number of colliery engineers of experience is that known by the name of Mr. Robinson, of Messrs. Bolckow, Vaughan, and Co.'s works. It has a great advantage in being able to take coal or coke of all sizes at one operation; and the sizing or screening may be done after washing if desired. In comparison with the "felspar" system, the plant required is less costly, occupies less space, and settling-tanks for the foul water are not required. The water is used over and over again, and the cost of circulating the same is not great. The makers claim to treat 400 tons per day of 10 hours at a cost of ¼d. per ton for labour, and at a cost of 1¼d. per ton all charges and interest included.

For 10 tons per hour, a conical vessel 5 feet deep and 6 feet in diameter at its upper surface is required. The

coal or coke is delivered by shoot into the centre of an inverted cone, while the water enters under pressure at the lower portion. The mingled water and good fuel pass out by an annular space into the drainage shoot, where the good material is collected into a raised bunker, while the water flows to a pump used underneath for re-circulation. The heavy parts collect at the bottom, and are withdrawn into a bunker by opening a pair of sliding doors at intervals. This latter operation could, of course, be made continuous and automatic if so desired. The mingling of water is rendered complete by the uprush from the point of entry, and by an agitator placed vertically, which also keeps loose the dirt which accumulates. When inspected by the author at the Lofthouse Colliery, the working appeared quite satisfactory; and he has now arranged for a quantity of gas coke of mixed sizes to be washed and afterwards screened. The gravity and percentage of ash will be determined for each size of the washed material and residue.

The Wood and Burnett coal washer is a belt travelling along an inclined trough down which water is flowing. The fuel and water enter at the head of the trough; the good stuff being carried by the water to the bottom, while the dirt is carried over the top and is received in a bunker. The good material is allowed to drain over perforated plates, and is then elevated into bunkers, while the water is re-circulated.

The Eliot washer is somewhat similar to the one last mentioned. As installed in the Thornhill Collieries, near Dewsbury, it consists of a pair of inclined troughs (each of which is worked separately), 60 feet long, fitted with close-fitting scrapers. The inclination is about 1 in 10, the trough is from 20 to 10 inches wide and 7½ inches deep, and the scrapers are 4½ inches deep at 6¼-feet centres on a conveyor chain. The water enters at the head of the troughs, and the coal midway. The good material passes out at the bottom, and the dirt at the top.

The Joselin patent washer is arranged to separate coke from inferior material by scraping from near the surface of the water all that floats there. To carry this method into effect, an oblong vessel is employed, fitted with an inclined plane, which starting below the water-line emerges above the vessel, so as to allow of the drainage of the coke removed by a series of scrapers. The scrapers are perforated, and are secured by hinges to a conveyor chain working over sprocket-wheels so placed above the vessel that the scrapers dip into the water where the supply of coke enters, and emerge from it to carry up the inclined plane the lightest and cleanest portion of the coke. These oblong vessels are arranged in pairs, and the precipitated matter is automatically removed from them by a screw conveyor, elevating it to any height desired out of a channel common to the two vessels before mentioned.

Coke breeze from the Halifax Gas-Works has been treated in three of the washers mentioned in this paper, with the following results:—

Size.	Percentages.		Specific Gravity.		Ash per Cent.		User's Report.
	Good	Residue.	Apparent.	Real.	In Good.	In Residue	
Through ¾-inch square mesh (*a*)	81	..	0·451	0·973	8·94	66·86	Very good
	..	19	1·003	1·729			
Do. (*b*)	84	..	0·472	1·007	12·40	55·04	Moderate
	..	16	0·877	1·680			
Through 1¼-inch square mesh (*c*)	58	..	0·370	0·870	13·3	..	Excellent for use with blast
	..	42	0·540	1·129	..	14·1	
Through ¾-inch square mesh (*c*)	36	..	0·404	0·844	11·3	..	Excellent
	..	64	0·593	1·255	..	23·3	
Through ⅜-inch spaces (*c*)	29	..	0·446	0·862	9·9		Excellent for light forgings
	..	71	0·648	1·265	..	28·5	

(*a*) Treated in the Wood and Burnett washer at the South Hetton Colliery.
(*b*) Treated in an Eliot washer at the Thornhill Colliery.
(*c*) Treated in an experimental washer at Heenan and Froude's works.
N.B.—The gravity of the coke is affected by its compactness, due to degree of carbonization, &c., as well as to the percentage of ash in its composition.

An examination of the washed coke, and the use of it in a smith's fire, reveal the fact that the lightest only has been removed by the Heenan and Froude's washer, and that the residue is a mixture of refuse with a quantity of coke in which pieces of scale are imbedded. If this residue were treated in a washer in which an uprush of water is maintained, there is no doubt a further separation could be effected, resulting in a second quality of coke with a residue nearly all refuse.

The best all-round results will be obtained by purchasing for carbonizing nothing but washed or hand-picked fuels; and when this is accomplished economically, the necessity for coke washing will have diminished. The use of washed coal necessitates precautions to secure freedom from excessive moisture; and this will probably be obtained better by purchasing in the washed state than by carrying out the process at the gas-works. Until clean coal can be purchased at an economical rate, the washing of the coke will be necessary, and it will be worth consideration whether future plants shall be designed to wash the whole or only the smaller cubes.

Storing.—The storing in hoppers provided with doors for discharging the coke into railway trucks, carts, &c., is a comparatively simple matter, if attention is paid to the head-room required, the stock of coke to be held in proportion to the retort-house production, the quantity of each size of coke that will pass through each grade of the screen, the capacity to be allotted to the washed coke, and the fact that the dropping of the coke must be down shoots to prevent the formation of dust. Where only the small cubes are washed, it may be desirable, under certain local conditions, to pass the coke from the screens on to picking-belts before depositing in the hoppers, so that the refuse may be removed by hand. Where a large trade is done by retailing in bags, special discharging-shoots are advisable for the convenient filling of the bags, and for measuring or weighing the same. The arrangements of Mr. Hunt at Birmingham, and of Mr. Braidwood at West Greenwich, are worth inspection, and especially in this regard.

Storing of coke in the open (or as at some works in large sheds) may be done in a variety of ways: (1) By lifting trucks by hydraulic hoists from the ground level to an overhead railway, commanding at a sufficient elevation the area to be covered, as at Vauxhall. (2) By a crane on an elevated railway (as at the Dawsholm, Higginshaw, and other works), or by cantilever or jib crane, or by Mr. Woodward's method, as described in the earlier parts of the paper. (3) By a combination of conveyor, elevator, and travelling conveyor, rectilinear or rotating. The reloading and screening of the coke from the store heap is accomplished without extra machinery by the second method; but where large quantities are to be handled under the third, it might be worth using an underground conveyor. The proportion of the year's make that has to be loaded up from the heap need not be great, and, under ordinary circumstances, would be filled by fork or shovel into carts brought alongside.

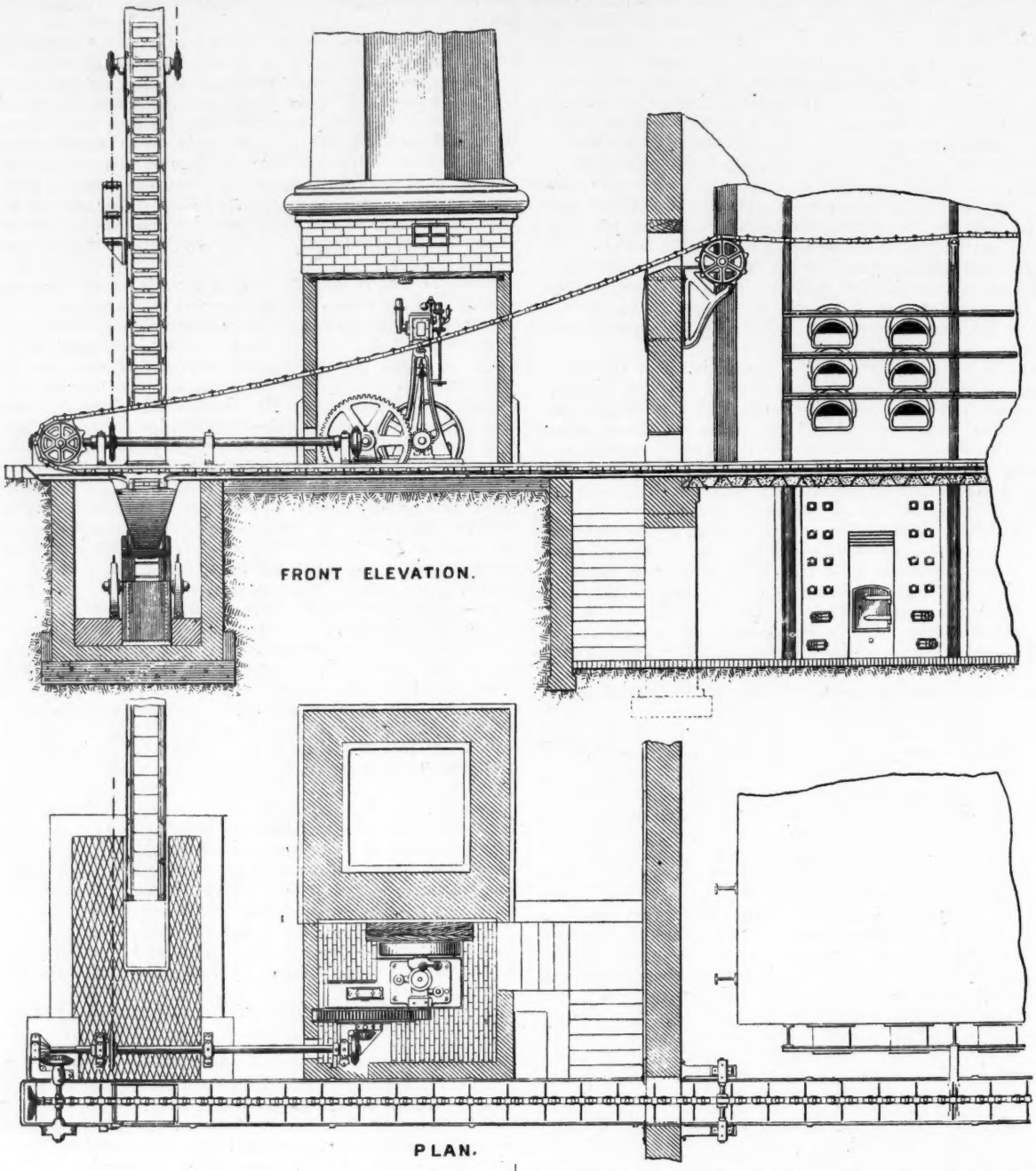
The following are combination plants based upon the types before mentioned.

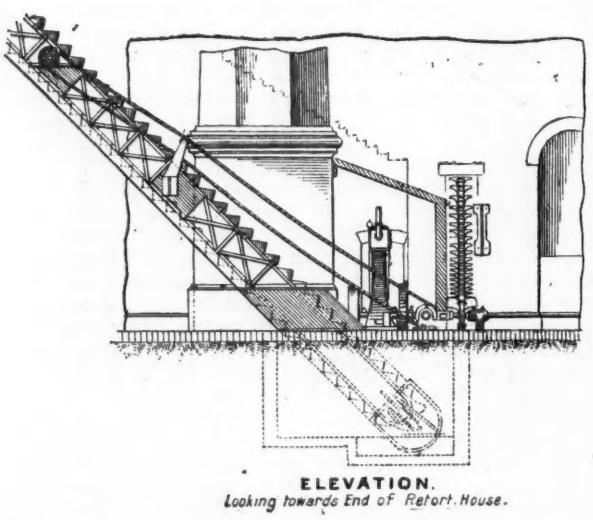
1.—Gaythorn Gas-Works, Manchester.

The retort-house is fitted with eighteen arches, each containing six inclined retorts 20 feet long. The trough is 212 feet long by 27 inches wide and 9 inches deep, fitted with West's conveyor links and scrapers combined therewith at 12-inch centres, travelling at a speed of 54 feet per minute. The wear upon the central path raised in the trough is taken by sliding blocks in the chain, which can be renewed when necessary, and by the table of a T-iron, which is also easily replaced when worn. The upper surface of the trough is flush with the retort-house floor; and the return chain is carried over rollers resting on buckets spaced at 9 to 11 feet centres. Tension gear for adjusting the stretch of chain is provided at the point farthest from the engine and the driving pulleys. The discharge from the conveyor trough is by a shoot directed towards the buckets on the elevator. The buckets are 16 inches wide, of 28 lbs. capacity, and each alternate one is fitted with an axle, carrying at its extremities a roller 6 inches in diameter bushed with Babbitt's metal. All the principal bearings are lined in the same way, and are found to wear less than any other metal, as proved by previous experience at the Windsor Street Gas-Works, Birmingham. The links are Hunt's patent, at 6-inch pitch, and run at 86 feet per minute. The height of the elevation is vertically 37 feet; on incline, 52 feet; and the plant is capable of lifting 60 tons per hour.

The screen consists of a flat plate 7 feet long by 3 ft. 6 in. wide, making 160 vibrations per minute, with a travel of 4 inches at an inclination of 1 in 6. The orifices are

THE GAYTHORN COKE CONVEYOR.





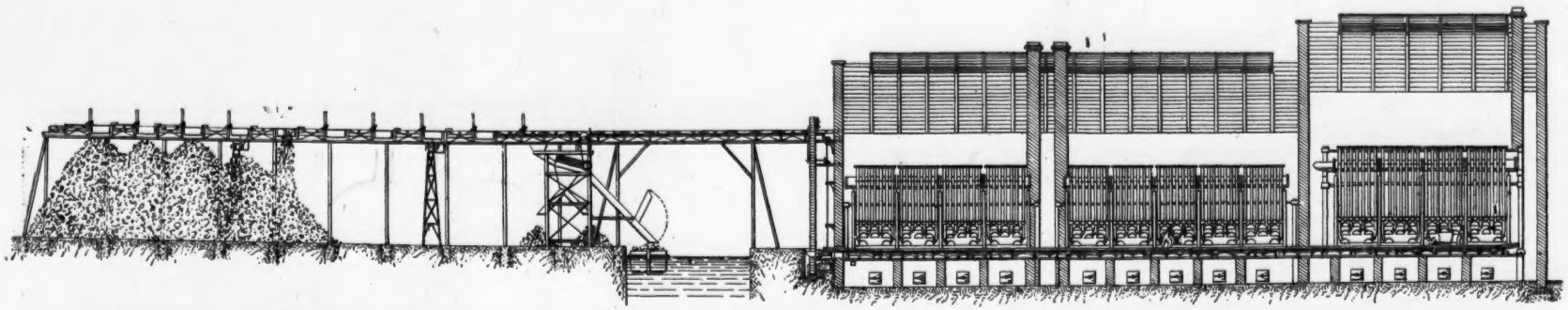
ELEVATION.
Looking towards End of Retort House.

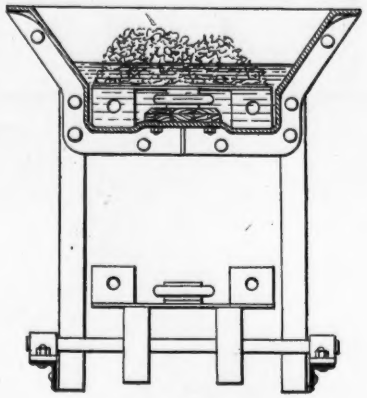
1⅛ inches diameter, placed at 1¾ inch zigzag pitch. The cold coke conveyor is 167 feet long, with plates 2 ft. 4½ in. long by 1 foot wide each unit. The ploughs are at an angle of 60°. The motive power is a vertical steam-engine of 11 inches diameter and 12-inch stroke, supplied with steam at 55 lbs. pressure per square inch, running at 90 revolutions per minute. The indicated horse power is 20, required for working the hot coke conveyor, elevator, screen, and cold coke conveyor.

2.—THE SMETHWICK COKE CONVEYOR.

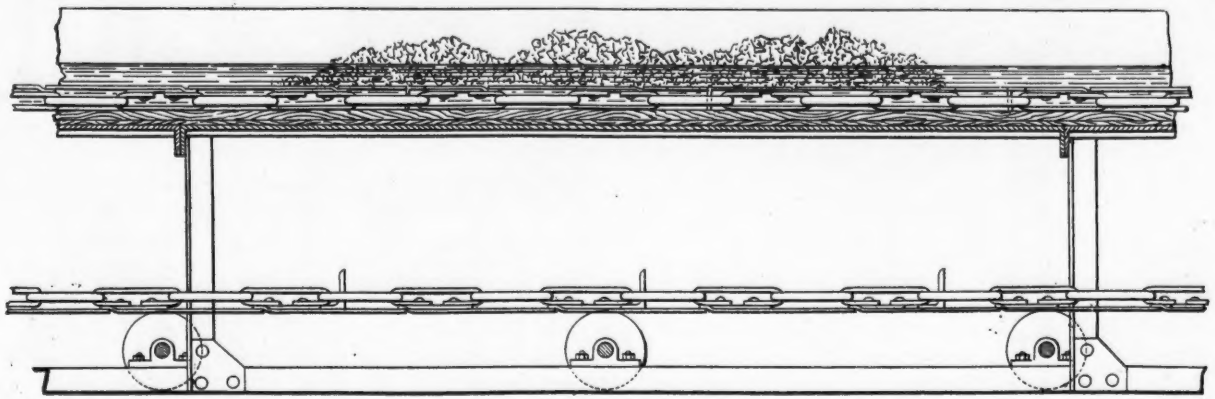
This conveyor is formed by a tapered cast-iron trough made in lengths from 4 to 6 feet, and fixed conveniently below the mouthpieces of the inclined or horizontal retorts. The bottom of the trough has a raised part running all along, to form at each side a small gutter, into which the coke dust falls and is conveyed by means of push-plates or scrapers to the breeze or dust collecting box fixed at the delivery end. The centre part of the trough on which the endless chain slides is formed of Australian "iron-wood" in double strips; the top strip being secured to the under one in a way which admits of easy and cheap renewal. The chain is formed of alternate ordinary oblong links and flat steel section bar links. Each of the oblong links is made from a bar of round steel bent to fit into the openings

THE SMETHWICK COKE CONVEYOR.



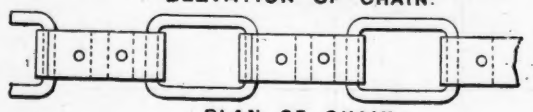


CROSS SECTION.

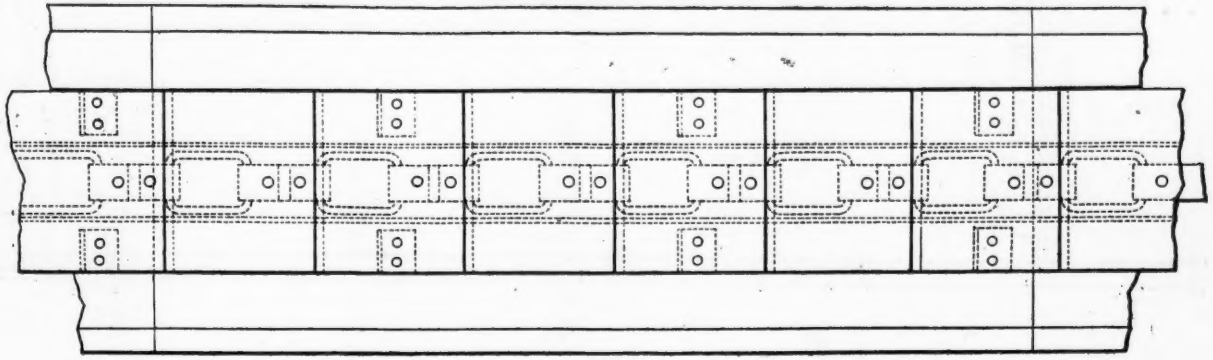


LONGITUDINAL SECTION.

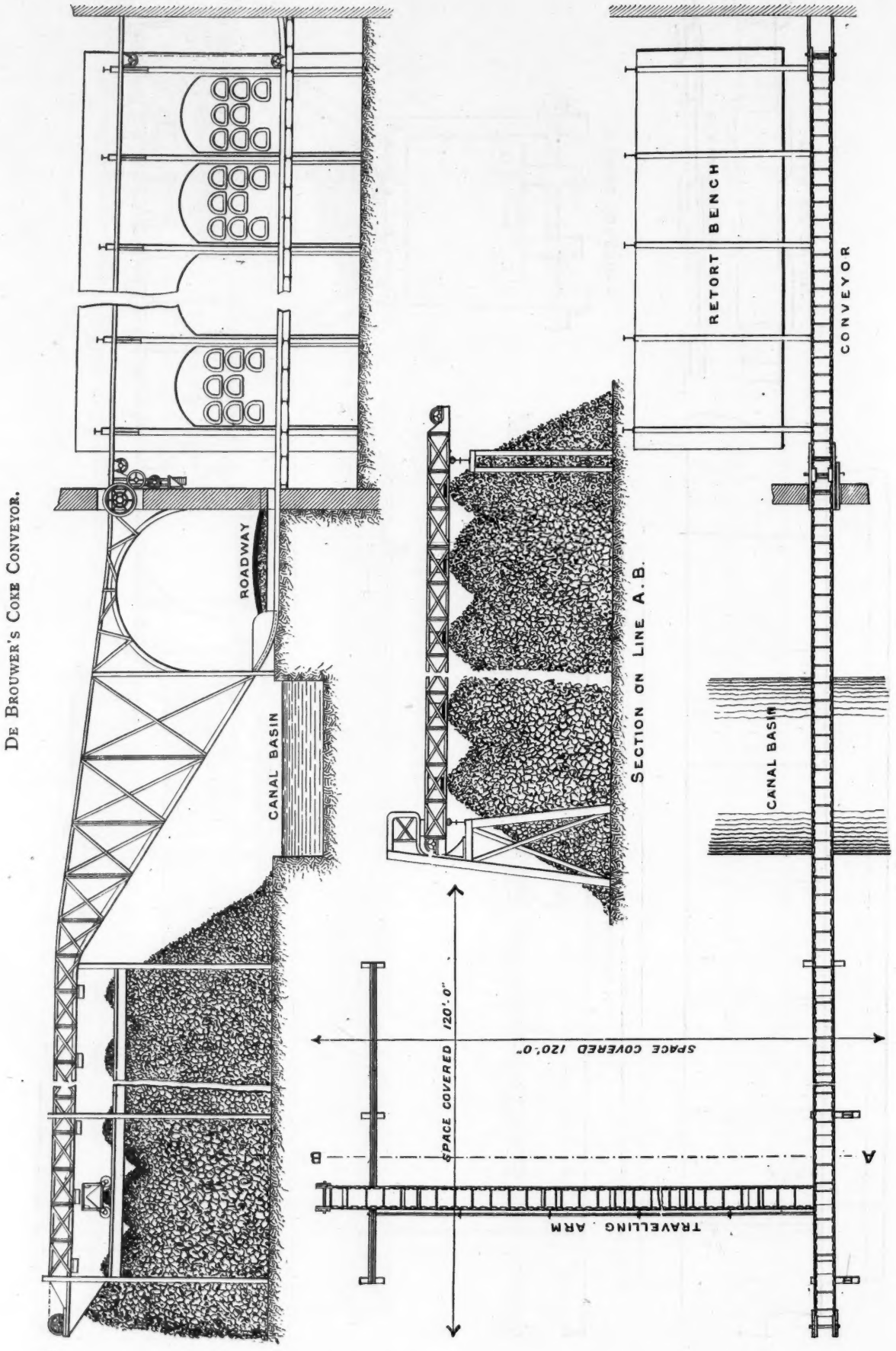
ELEVATION OF CHAIN.



PLAN OF CHAIN.

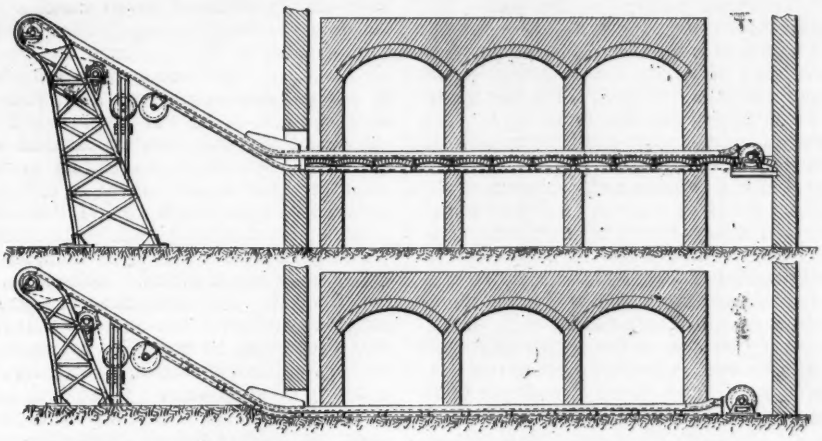


PLAN



DE BROUWER'S COKE CONVEYOR.

De Brouwer's Coke Conveyor.



in the flat bar links. This form of chain is free from pins, and the slide gutters keep away the dust and grit from the joints of the chain. The endless chain travels on the wood path all along the trough, and round the driving or end drums in the usual way, and back over the rollers carried by hangers under the trough slings or standards. After the round links are threaded through the openings of the flat links, the openings in the latter are closed over by a cover plate; and on the top of this cover plate there is fixed to each flat link another plate of the proper width to work in the trough. These coke-carrying plates are about an inch longer than two links, so that a neat joggle is formed to overlap each plate, and present nearly a level steel-belt surface on which the hot coke falls to be conveyed. These plates form a moving bottom to the trough, by which the coke is conveyed along at about 30 feet per minute. The dust, so detrimental formerly to chains unprotected from coke grit, falls between the edges of the plates and the sides of the trough into the side gutters, whence it is removed by the push-plates fixed at intervals of 4 to 10 feet to the underside of the plates, so that as the machine is at work conveying and slaking the coke along the trough, the push-plates or scrapers also scrape the coke dust along the gutters, and deliver out at the end of the trough. In the installation of this coke conveyor at Smethwick, the four beds on the right-hand side are inclined retorts, and all the others ordinary horizontal retorts; and the coke from both is carried in the way already described to the end of the retort-house into the elevator, and thence to the overhead conveyor, which delivers it through the coke-screen to the barges or over the storage yard.

3.—The De Brouwer Coke Conveyor.

This conveyor has been much in use on the Continent (in Holland, Belgium, Germany, and France) for several years, and on account of its great simplicity it has succeeded in doing work which has caused many other schemes to be abandoned. By means of simple cross-bars, the coke, both large and small, is moved along without turning over or crushing—simply sliding steadily along from end to end of the conveyor, and up the sloping delivery end to any desired height.

The De Brouwer conveyor consists of a shallow trough placed in or on the retort-house floor, and a double length of special chain kept apart by distance-bars at intervals of about 2 feet, so as to run parallel and form the transmitting portion of the apparatus. The trough is made of cast iron, mild steel, or wrought iron; and it varies from 20 inches wide for small settings of horizontal retorts up to 2 ft. 9 in. wide for large installations of inclined retorts—the width depending upon local circumstances. The depth of the trough is determined by the style of the floor, but is usually 5 inches, though for wide conveyors 3 inches will answer quite satisfactorily, because the bulk of the coke falls near the centre of the pan, which is made very wide to give ample room, so that no shovelling is required.

The chains are kept purposely as near the side of the trough as possible, because the greater portion of the coke falls in the centre—very little reaching the sides; consequently, less wear and tear comes upon the chains. The bottom of the trough is also quite flat and plain, without projections or other causes of obstruction and friction to the moving coke. The bottom plate, usually about $\frac{3}{8}$ inch thick, is riveted to two angle-irons, one on each side, forming the sides, and the joint is made water-tight. Then the removable wearing angles or strips are fixed in the corners to carry the chains. All bolts and rivets inside the pans are countersunk, and no projections are allowed. Near each end the pan is bent upwards, so that the quenching water may not escape; and at the delivery end, when the coke requires to be placed in hoppers or railway waggons or on the store heap, the conveyor is bent upwards at any suitable angle, and carried to any convenient height. It may then be bent horizontal again and continued any desired distance. In cases where it is inconvenient to have the return chain carried above the mouthpieces, owing to want of space (on account of stoking machinery or other causes), the return chain can be carried back directly under the delivery pan all the way; the total depth of the whole conveyor not exceeding 8 inches throughout.

Water for keeping the chains and pan cool, and for quenching purposes, is run into the pan continuously while the conveyor is at work. When commencing, the trough is partly full of water throughout its length; but as soon as the coke begins to be drawn it pushes the water before it along the trough, and for some distance up the quenching slope at the delivery end, when the water overflows back over the still hot coke and saturates it—thus completing the quenching. Comparatively little steam is produced in the retort-house until the quenching slope is reached, when large volumes are generated; for the quenching is thoroughly done, and the coke requires no further attention to put it out.

The De Brouwer conveyor transmits its load of coke from the retort-house floor to any height and any distance in a straight line, without once dropping it or changing its position in relation to the propelling bars and the pan of the conveyor. When it becomes necessary to change the direction to one at any angle, the coke need not be dropped more than a foot; for the construction of the chain is such that either the top or the bottom strand can be used equally well for conveying.

The use of the conveyor as an inclined elevator is nearly always adopted. For instance, at Bruges there are two conveyors, and at Ghent eight, each with an inclined end going up about 16 feet, and delivering at the top. At Ostend there are two conveyors in front of the benches, each with inclined ends going up about 20 feet, besides other installations of the same kind at other works. At Bruges, the Hague, and Ostend, the return chain is overhead. At Ghent, the eight retort-house conveyors have the return under the delivery pan, and nothing can be seen of the conveyor in the retort-house except the shallow trough in the floor, while outside the retort-house the sloping end appears to be a girder $7\frac{1}{2}$ inches in depth; the whole of the delivery and return being included in this space. In these works, the removal of the coke from 24 through beds of eights, arranged in four stacks of six through settings each, is done by the foreman, who starts the conveyors by throwing a clutch into gear when required, and the coke is delivered into the yard at a height of 15 feet, and a distance of 35 feet from the retort-house, without any further labour or attention.

One of the features of this conveyor is the chain, which is formed of block links alternating with double links; the

block links being made especially high to take all the wear due to rubbing on the wearing strips of the pan. The single links are connected in such a manner that wear must come upon the full width of the portion passing through the hole in the block link; and they are held together by rivets which are made easy of removal, while being perfectly secure. The difficulty of keeping rivets tight when subjected to variations of temperature has been avoided in the recent De Brouwer chains by arranging the rivets so that they form no part of the wearing surface, but have the sole function of holding the links in place, so it does not in the least matter whether the rivets are tight or loose.

The load due to the weight of the chain forms by far the greater portion of the work and wear; that due to the coke being comparatively unimportant. A moving weight of 15 lbs. per foot run is attained, against at least 30 lbs. with plate or scraper conveyors of the same width and capacity. A conveyor to remove 20 tons of coke per hour would require a trough weighing about 2¼ cwt. per yard, and the chain for a long length of conveyor would weigh about 45 lbs. per yard, including all moving portions; for a shorter portion it would be about 36 lbs. per yard.

One of the diagrams shows the coke conveyor arranged to deal with the coke from nine beds of eight horizontal retorts, and four beds of eight inclined retorts, 20 feet long. The coke had to be taken out at the end of the retort-house, under a roadway, over a canal, and then to be screened and loaded into boats, or stored on a surface 120 feet long by 120 feet wide, to a height of 26 feet. The diagram shows the scheme in plan, elevation, and cross section near the travelling gantry.

It was proposed to take the coke from the retort-house to the quenching slope outside, then up the inclined end to the desired height, then over the canal, and to a distance of 170 feet from the retort-house wall along a light latticed iron or steel bridge supported on standards formed of 12-inch by 6-inch rolled joists. These joists formed the supports for girders carrying rails on which the travelling span would run; and at about 85 feet span a second line of supports and rails would be laid to carry the outer end of the travelling span.

A simple and light lattice bridge about 100 feet long would carry the conveyor transmitting apparatus; and the coke could be delivered at the end, or at any number of intermediate points. The bridge would be propelled at intervals by hand as the space became filled; and the driving of the sprockets would be by means of ropes passing partly round three pulleys arranged exactly as is usual on rope-power travelling cranes. About 2000 tons of coke could thus be stored without requiring more labour than the services of one man per shift to start and stop the conveyor, and place the travelling span where desired. The total length of the conveyor was about 380 feet from end to end.

As regards the amount of labour required to deal with the coke, it may be said that, even in large installations, not more than one man will be wanted for attending to the conveyor, and delivering the coke from it.

The next section of the paper dealt with the proposed design for coke-handling plant at the new retort-house of the Halifax Gas-Works—a house, 266 feet long, intended for inclined retorts, with 17 settings on the north side and 25 settings on the south. The quantity of coal to be charged per hour is estimated at 21 tons; and the quantity of coke at a maximum of 55 tons per hour. We intend giving some particulars of this plant in a later issue. The author concluded his paper as follows.

The points of similarity and dissimilarity may be noted, and the cost in interest on capital, wear and tear, and labour estimated relative to each individual case. It has been found impossible to make a comparison of the cost for an ideal combination of retort-house and coke-yard for the different types of plant; but even if this had been done, the local conditions of each case would be the determining factor. The author believes that the appliances now available, should allow, in large works, of coke-handling being done for a labour charge not exceeding 2d. per ton of coal carbonized.

Discussion.

Mr. G. E. Stevenson (Manchester) said the paper was certainly most thorough and complete, handling the whole subject of coke-conveying plant; and it must have involved a great amount of labour. They were indebted to the author for giving a lot of information which they could not have readily obtained in so concise a form elsewhere. His remarks would have reference chiefly to the coke-conveying plant at the Gaythorn station of the Manchester Gas-Works. This was in connection with an installation of inclined retorts, and was somewhat of an experiment, because so far as he was aware when he decided upon it there had not been any mechanical conveyor for coke applied to inclined retorts, and he was somewhat doubtful whether there would not be a difficulty with the large quantity of coke which would fall out of an inclined retort at once; the conditions being somewhat different to those where horizontal retorts were used, and a small portion of coke was drawn at a time. No trouble, however, had been experienced. The coke-conveyor employed was of such ample capacity for the quantity that it had to take away, that there was no crowding or congestion whatever. It worked extremely well mechanically; and he considered it a very great success. There had been nothing in the shape of weakness or defect from beginning to end. The other portions of the arrangement—especially that which conducted the coke overhead to the coke-hopper—had not been quite so satisfactory from all points of view. It was a plate conveyor; and he must say he was not at all inclined in future to have anything to do with plate conveyors. The drag conveyor was far better. There was not the slightest fear of coke being broken up by being dragged along in front of the retort-bench when it fell out of the inclined retorts, as it did if the coal were properly carbonized. It assumed the form of an oblong heap in the trough—covering the chain, links, and everything; and then it travelled along without being in the least disturbed, until it came to the shoot and fell into the elevator. This was much like other elevators, except that the buckets were fixed so close together that no coke could fall between them; and the shoot was so constructed that its mouth was exactly over the bucket as it came up, and just the size of the bucket itself, so that nothing dropped into the pit below. The shaking screen was also very useful. The sole purpose for which it was placed there was to take out the dust or breeze; and it only took out quite the smallest stuff. It was not intended to sort the coke into sizes. With regard to the saving effected by conveyors, he was particularly struck with the statement in the paper that the cost of labour in hauling coke by drags, and so on, was as much as 5·3d. and 4d. per ton. He was afraid that in these cases there had been very little saving effected, because there was no difficulty in wheeling coke from the retort-house and depositing it in the yard at something like that figure. In Manchester, they had actually saved about 4⅜d. per ton by doing away with coke wheeling. They had twelve coke wheelers before putting the conveyor to work, three on each shift; but these men were not needed any more. In their place there was only one man to look after the whole of the machinery. The wages of the coke wheelers amounted to 4⅜d. per ton. The capital cost of the installation at Gaythorn was £2440, everything included, and this worked out at £11 5s. 9d. per double mouthpiece. Naturally, this rate of cost would be very much diminished if there were a longer line, because the outside portion would be the same whatever the number of retorts; it would only need a longer trough. The estimate he gave last year of about £10 per mouthpiece might therefore be fairly taken as correct. The wages saved were £7 10s. a week on about 900 tons of coal, which in a year came to about £500. The saving in wages, therefore, would practically be equal to 20 per cent. on the capital cost of the plant.

Mr. William Foulis (Glasgow) asked if Mr. Stevenson could say anything about wear and tear.

Mr. Stevenson remarked that it was not possible yet to say anything definite about that, because the machinery had only been at work for about three months. From what he could see, however, he did not think it would be in any degree excessive. There had been no breakdown, with the exception of a driving chain link giving way once or twice; and he did not think the wear and tear in driving would be very great. The trough had already become smooth with the rubbing of the coke; and as it did so, the friction decreased. Mr. Woodward's scheme, to which reference was made in the paper, was one for a circular gantry with a train running round, which was going to be put up at the Bradford Road works. But this was simply a method of stacking coke; it was not a conveyor at all. The coke

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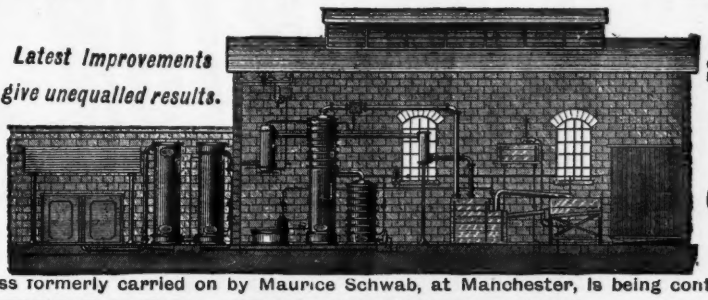

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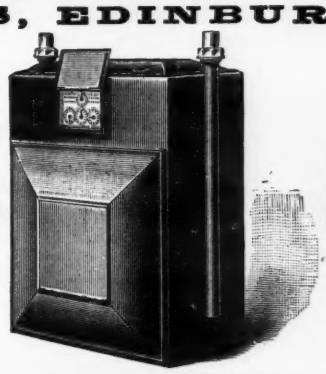

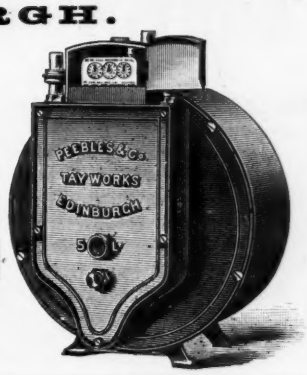

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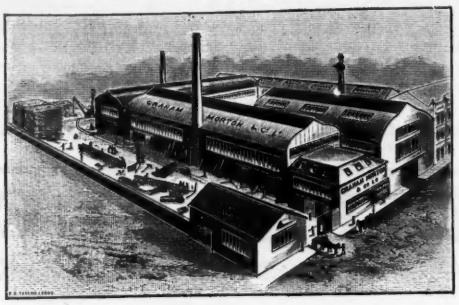
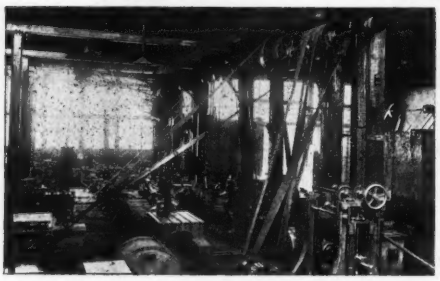


COAL CONVEYORS

View of Works.



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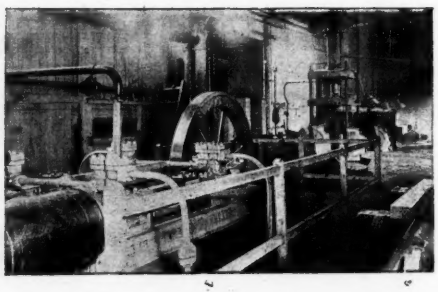

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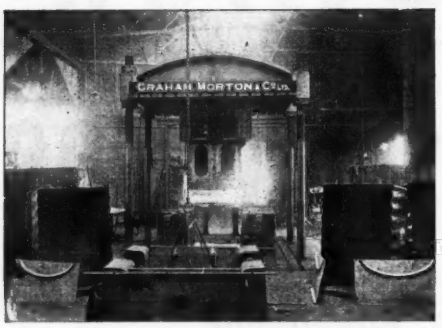

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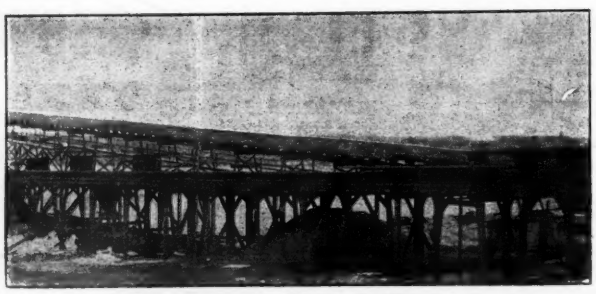

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had to be brought there first, before it could be dealt with by the crane, and he did not anticipate any very great saving of labour from the arrangement, though no doubt it would prevent the breakage of the coke and the deterioration to such an extent as took place at present when they were bringing the coke to a heap on rails laid on the coke, which was very injurious.

Mr. E. A. Harman (Huddersfield) asked what was the quantity of coal carbonized at the Gaythorn works. Mr. Stevenson had given some very useful figures; but the amount of coal carbonized per annum was wanting. He should like to make a remark with reference to the statement that pan or plate conveyors, however suitable for coal, were not so for hot coke. He thought this was at least a debateable point; and after having used one of these pan conveyors for a considerable length of time without difficulties of any kind, he could not admit the correctness of the statement. His own impression was that pan conveyors, made of suitable metal, were quite as good for dealing with hot coke as with coal.

Mr. Stevenson said the 900 tons a week he mentioned as the quantity being carbonized was not the whole of the work done at Gaythorn station—only what was carbonized by the inclined retorts, and dealt with by the conveyor.

Mr. P. H. Fletcher (Evesham) asked if Mr. Holgate could say which conveyor brought the greatest amount of useful coke into the yard—the one that carried the coke or the one that pushed it. He should imagine the one that pushed the coke must reduce it to a smaller state than the one that carried it.

Mr. Thomas Glover (West Bromwich) said he had been following this subject for some time; and as his Committee had under consideration the question of installing coke-conveyors, he had been looking at the cost of doing it in the primitive fashion in vogue in many gas-works with barrows. Four years ago, when he took charge of the works, the coke was drawn on to the floor, loaded into barrows, and wheeled out; and the same system was practised in many works at the present time. But at the standard rate of wages in South Staffordshire, this cost 8¼d. a ton, and the loading it into boats or carts cost 4¼d. more; so that the total labour charges on the coke were 1s. 0½d. per ton. In a short time after introducing machinery, they started some steel conveyors of a special design, which brought the cost of loading down to 11d. per ton—making a saving of 1½d. per ton. But they were not content with this, believing the labour charges were still far too high; and they were at present considering what form of conveyor they could introduce. In working out the cost on an assumed capital charge of 2½d. per ton of coke, the labour charges at 2½d., and the driving power at ¾d., the cost would come to 5¾d. per ton, which would effect a saving upon present methods of 5¼d. per ton, or on the production per year of 15,000 tons of coke of about £323. This would show that it was a matter well worth consideration by all who had works carbonizing from 20,000 to 30,000 tons of coal per annum. There was no doubt in his mind that the cost of handling material in gas-works was far too high; but he hoped they were on the way, by using stoking machinery, conveyors, &c., to bring it to a much more moderate figure.

Mr. John West (Manchester) said they must all be very pleased that Mr. Holgate had laid such a mass of matter before them, for he had gone into the subject most thoroughly. He had been acquainted with the advantage of machinery and conveyors for a very long time. Speaking on the principle generally—for it might appear invidious to select any special system—the mechanical conveying of coke and coal was a very important matter indeed; and he could give a number of facts and figures which showed that the saving had proved to be considerably more (especially on the large scale) than was even anticipated at first. Mr. Holgate had put it very clearly; and in comparison with other schemes there was no doubt the conveying scheme was most economical, and would no doubt be the one generally adopted. They had introduced something very special for Mr. Stevenson at the Gaythorn Gas-Works; and he could assure them the results of the working had come out quite beyond their most sanguine anticipations. The whole thing worked smoothly and nicely. With regard to wear and tear, this was a very important factor. For many years they had to struggle against this difficulty in coke-conveyors. It was very different conveying coke to conveying coal; but he might say that many minds had been brought to bear on the problem. Speaking generally, the makers had met the difficulty; and wear and tear was now reduced very considerably—more so than had been expected. By the adoption of proper material, applied in the proper manner, this difficulty had now been practically overcome. It would never come so low as coal conveying, because coal sometimes assisted in lubricating the parts, while fine coke acted like emery on a wheel; but they protected the bearings and everything as much as possible, and made the mechanism as simple as they could. He should say that this principle was worth every gas engineer's consideration; and the sooner he decided to adopt it, the sooner he would find the cost of manipulating his materials would be reduced.

Mr. Samuel Glover (St. Helens) said there was one other point he should like to mention—namely, that it became almost necessary to have some method of removing the coke quickly where inclined retorts were adopted. How it could be removed as quickly as it could be discharged without mechanical means like some form of conveyor, he did not know; but it seemed to him that something of this kind became a necessity. He should like to ask the author, who he believed went to the Continent when the Institute paid a visit there, if he saw any evidence of the ability of the De Brouwer conveyor to elevate the coke at such an angle as was shown on the diagram. It seemed to him very unlikely that a heavy iron cross-bar connecting the two side chains together would have a sufficient grip on the coke to push it along in the way it would have to go up the incline shown on the diagram. Mr. Holgate, referring to the method of the conveyor adopted at Gaythorn, mentioned an important feature in addition to the fact that it did not show much wear and tear—that the part which was most susceptible to wear was the part most renewable. This was very important. He did not know whether the others were so readily renewable; but he was quite convinced that though the diagram of the Manchester conveyor did not show any elevated pathway for the coke, if the one with the iron cross-bar would convey coke at the angle indicated, the other would do it much more perfectly. He had seen it in operation at the works of which Mr. Stevenson had charge, and was quite convinced that coke conveying was much more feasible now than it ever was before, without any destruction of the coke of which there had been great fear in some quarters. The uneven shape of the stream of coke assisted the mass to travel along without any rolling. He had almost expected that it would become like pebbles; but there was no rolling motion at all. Not only was the coke pushed along, but the fine dust in the bottom of the trough was pushed along; and the water also in front during the work of slaking the coke. With regard to coke washing, the paper was not quite so complete; and he noticed that the author had not described the coke-handling plants which were now in operation at the works of the Corporation at Nottingham, under the charge of Mr. Chester, which had been in use in an efficient manner for some years, dealing with coke of different sizes, and washing it and preparing it for market. With regard to the remark as to the analyses of coke from retorts charged by West's machinery, he thought the result would depend entirely upon the quality of the coal; and it was really of very little value except for the particular kind of coal which was being dealt with at the time.

Mr. B. W. Smith (Smethwick) said, in consequence of the great demand made by his men during last winter for an increase of wages, his Committee had decided to put in a coke-handling plant. The plant was not yet fixed; but they anticipated that they would save at least 5½d. to 6d. a ton in either putting it into bags or on to the stacking ground. He felt sure, from the remarks made by other speakers, which he could fully endorse, that it became day by day more important for either small or large works to put down coke-handling plant to save the enormous amount of worry and anxiety in the winter of dealing with the coke and contending with the strikes and irregularities of the men. He did not think there was anything with reference to which so much trouble had arisen in the winter as in dealing with coke.

Mr. C. E. Botley (Hastings) said he had not come to a conclusion as to whether the system he should introduce in their new works should be taking the coke from a vault by some method of wire haulage, and whether this would be as economical as putting up conveyors. The difficulty he had felt was the difficulty of many others—the question

of wear and tear. The information which had been given with regard to this point seemed to show that it was a trouble which had been overcome to a very large extent; and he had no doubt this would lead to a further adoption of the system of conveying coke in a similar manner to that in which coal had been dealt with.

The PRESIDENT said personally he had never been in favour of mechanical coke-conveyors, because he thought the wear and tear would, in spite of all that had been said to the contrary, be very great. There were reasons for this wear and tear which it was very difficult to deal with. It was conditional on the fact of quenching the coke on the floor itself. It did not matter how simple it was, or how well the conveyor was made, if one allowed it to get anything like red hot, and put water on it for quenching purposes, it must be ruined. The life of the conveyor depended entirely on the way in which the coke was quenched. During the last five years, he had seen many conveyors of every description; but the only one which fulfilled all that was required of it was the De Brouwer. This worked in water; and it seemed to be a *sine quâ non* that the coke should be quenched as soon as ever it touched the fabric. But there was a great drawback to this, because when coke was quenched in the retort-house it was a great annoyance to the men. The men in Denmark were not very particular; but they objected strongly to having the quenching going on under their noses. They said they were choked, and demanded higher wages in consequence. Therefore, in using coke-conveyors, every possible endeavour should be made to quench coke outside the building. But, on the other hand, if this was done, then the conveyor got hot. There were therefore these two difficulties—either the coke was quenched as it went on the floor, and choked the men; or it was quenched outside, and spoilt the conveyor. He had tried, in designing the new Fredericksburg works, to do away with the conveyor, and had a system of waggons on Hunt's principle, which opened to discharge their loads, and were made of strips of steel. They were filled, and ran along to the end, and were then elevated by a hydraulic lift, and allowed to run along a switchback railway, eventually to the other end of the house. But he was obliged to confess that it was a great failure. They found that by allowing the coke to run straight into the waggons they became almost red hot; and when the waggons and coke were subjected to the quenching process, the waggons twisted and warped, so that for every man saved in the retort-house they had two smiths outside, repairing damages. Then, again, they raised the coke up to its level, and started on the level with a switchback conveyor; but for the first week they had eight out of ten over into the manager's garden. They had a lovely incline, all worked out beautifully; but they had forgotten the wind, and when the wind was behind the trucks even the switchback was unable to control their motion. The result was that every morning the manager found a coke-waggon in his greenhouse or his fowl house; and he got so used to it that it did not even wake him up. They had to give it up as a bad job; and in this instance he had to record a failure. He was just now building a large new retort-house in Copenhagen, and having it fitted with the De Brouwer plant, which he hoped to find would be able to deal with the inclined retorts. If any gentlemen came over in the autumn, he should be happy to show them a very fine house, with inclined retorts and the De Brouwer conveyors at work. Personally, he must thank Mr. Holgate very much for his paper. In some respects, it partook of the nature of a specification; but if it was rather dry to listen to, it would form a very valuable book to study at home, when they were called upon to construct a coke-conveyor.

Mr. HOLGATE, in reply, said some of the figures given as to cost referred to the cost per ton of coal carbonized, and others to the cost per ton of coke handled. They heard from Mr. Stevenson that at the Gaythorn works there was a saving of £7 10s. per week, which worked out to 4⅜d. per ton saved by the conveyor as against hand labour. The comparison of saving would, of course, be much greater where the conveyor was used in the way that Mr. Stevenson did at Gaythorn, than where the rope-haulage arrangement was adopted. If Mr. Harman could have given them something of the details with regard to the hot-coke conveyor made of plates which proved satisfactory, it would have added to the value of his remarks. In the course of his inquiries, he had watched these hot-coke conveyors at work, and had come to the conclusion that, with the mass of material which had to be moved, the large amount of wear and tear in this form of conveyor was very serious. With regard to Mr. Glover's remarks, though the information he referred to might not be very valuable to him, it had been of service to themselves; and perhaps the plain statement of an actual fact might have some merit. The President had given them that morning a good lesson on the advantages of the scientific spirit; and Professor Clark-Maxwell, when asked to define what scientific research was, said it could be summarized in one word—"measurement." This might be taken to mean a definite statement of some plain fact; and he thought the plain statements in relation to the screening would have some value. Mr. Glover also expressed disappointment that no reference was made to the work done at Nottingham; but he understood that Mr. Chester himself was preparing a paper (to be read next month) on coke-conveying plant, in which he would make reference to what had been done there. With regard to the efficiency of the De Brouwer conveyor in lifting coke at an angle of 30°, he had no actual experience, and had not seen it done. At the Hague works it was simply moving the coke along a fairly level surface; but he was told, by those who had gone into the matter carefully, that 30° could be surmounted by this form of conveyor. If difficulties did exist, there was no reason why the plain cross-bar should not be changed for some kind of scraper, which would enable the coke to be taken up such an angle, or even up a steeper one. They would all be able to fully appreciate the President's remarks; but perhaps the quenching of coke in the retort-house might not be such a serious difficulty. They had been accustomed to it in England in ordinary retort-houses; and in the case of coke-conveyors he did not think it would be a serious difficulty to have some water in contact with the coke inside the house.

The PRESIDENT added that the De Brouwer conveyor would take coke up a slope of 30° with ease. In fact, they were thinking of making it take the coke up almost 40°. He did not believe the substitution of a scraper would help it. The effectiveness of the system arose from its simplicity; and he thought the bar did as much work as the scraper, and with far less wear and tear. But these questions could only be demonstrated by more extended experience.

Midland Association of Gas Managers.—We learn from the Hon. Secretary of this Association (Mr. Charles Meiklejohn, of Rugby) that the spring general meeting will be held at Wolverhampton on Wednesday, the 31st inst., under the presidency of Mr. J. S. Reeves, of Bilston.

Local Self-Government.—Mr. Pirie purposes calling the attention of the House of Commons to the desirability of further extending the application of the principle of self-government in the United Kingdom. He has put his suggestion into concrete shape in the following motion: "That the time has come when self-government in local affairs should be granted to the various countries of the United Kingdom, for which purpose legislative bodies should be created to which the Imperial Legislature might delegate the requisite powers."

The Combustion of Carbon Disulphide.—At the last meeting of the Chemical Society, a paper on the above subject, by Messrs. Harold B. Dixon and E. J. Russell, was read. The authors showed that carbon disulphide undergoes a phosphorescent combustion in air at temperatures below its ignition-point, the lowest observed value for which was 232°. Prolonged heating of carbon disulphide at 230°, or prolonged exposure to bright light, causes slight decomposition. The decomposition of carbon bisulphide vapour by detonation is not propagated as an explosion, and no explosive wave could be propagated in mixtures of the vapour and oxygen containing less than 40 per cent. of the latter.

Disease Germs Conveyed by Conduits.—The "Lancet" has been discussing the question of electric conduits bringing disease to the users of the electric light. It appears that in cases where the main cable is laid in a pipe beneath the footpath, the ends of the branch pipes for the house connections are left open, and a draught is set up into the house. This is due to the higher temperature of the premises; and as different temperatures exist in different houses, a communication is set up between them. Where one house is warmed with hot water and another is not so, a very considerable draught is set up; and where infectious disease is in a house, the germs may easily be carried to other houses. It is suggested that the pipes should be plugged with insulating material.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1387.)

THE week before Whitsuntide is always a quiet one on the Stock Exchange, unless something very unusual should occur to disturb the serenity of the financial atmosphere; and things have been nearly as quiet this time as at any other Whitsuntide. They might have been even more so, but for the renewal of uneasiness in regard to matters in the Transvaal, and further depression in the more speculative mining lines, which had their full effect as disturbing factors. The better classes of security, however, were pretty steady. Movements taken on the whole were only slight; and business fell very tame as the week drew to a close. The Money Market was easy, with a superabundance far in excess of all possible demands. As if to illustrate how frequently it takes a line of its own, the Gas Market was much more active than it had been for the previous week or two. But transactions were for the most part confined to a very small number of undertakings. Gaslight issues were, of course, pre-eminently observable; and there was far more done in them than in all the rest put together. When it is considered how bitterly the Company are being attacked in Parliament, and how serious may be the result of the proceedings now in progress, the firmness which marked the ordinary stock is noticeable. In the earlier part of the week, the stock was freely dealt in at figures which slowly hardened; but as business grew slacker towards the close, the price was not equally good. The secured issues were also pretty active at good average figures. South Metropolitan was quite quiet and unchanged. Commercials were firm, though one or two "special" lots were offered at low figures. The Suburban and Provincial group were quite devoid of incident; and quotations did not move. The Continental Companies continued in favour—Imperial advancing another point, while Union preference did the same. There was little to note among the rest, except that Monte Video had a slight fall; the accounts for 1898 not showing a very prosperous year. Business in the Water Companies was rather more brisk; and prices were good, but quotations were almost unchanged.

The daily operations were: Gas opened with some animation on Monday, and prices were steady. Imperial rose 1. Tuesday was equally active, with business mostly in Gaslights; but quotations stood still. On Wednesday, there were large dealings in Gaslights, but hardly anything else was touched. Union preference moved up 1. In Water, East London debenture rose 1. Transactions fell away to small proportions on Thursday and Friday; and on Saturday the Exchange was closed.

ELECTRIC LIGHTING MEMORANDA.

Local Authorities and the Depreciation of Electrical Plant—Necessity of Depreciation—One Way of Doing it—Coke in Calcium Carbide Manufacture.

IT is to be desired that all members of Local Authorities trembling on the verge of an electric lighting speculation should follow the analyses of electricity works accounts which appear in the "Electrician." It is a great help to a clear understanding of the true prospects of contemplated ventures of the kind, to be able to check estimates by actual performances. Only, consulting electricians are not reliable hands at this work. It is truly astonishing what encouragement to go and do likewise they can find in the most "awful examples." It sometimes happens that the responsible heads of the undertakings selected by our contemporary for statistical treatment do not like the remarks made upon the appearance of the principal figures in their case. Thus, the Borough Electrical Engineer for Hanley has complained of certain reflections expressed by our contemporary on the absence of any allowance for depreciation. This is the old story. Was it not the Corporation of Dublin who started the pleasing notion that the statutory municipal sinking fund is equivalent to a depreciation fund? We distinctly remember that the St. Pancras Vestry gladly jumped at the excuse for getting out of the obligation to provide such a fund, and came out with the avowal that they were quite willing to follow the Dublin practice in this regard. The Dublin experience is not one to be envied, or copied, at the present time. Mr. Lobley, of Hanley, declares that there should be a depreciation account in addition to the sinking-fund, before any profits are paid over to the relief of the rates. But he asks where the money for such a fund is to come from, when the profits are insufficient to cover the interest and sinking-fund charges.

The question is a very natural one; and obviously the situation of an Electricity Supply Committee of a Corporation obliged to pass over the question of depreciation because they feel themselves already a burden upon the rates, is not to be envied. But, as the "Electrician" very justly points out, the necessity for a depreciation fund cannot be removed by ignoring it. "There is little good purpose served by attempting to cloak a position of necessity under the ægis of a principle made to fit." The language is somewhat flowery; but its meaning is plain enough. It is necessary to din "depreciation" into Municipal ears, in and out of season, until the Corporations come to their senses in this regard. The absence of anything like a rule for the amount of a proper depreciation allowance is regrettable. Perhaps some unattached electrical expert will oblige by looking into this matter anew, with a view to supplying the deficiency. The difficulty is, of course, that every undertaking ought to have its own rule, determined with specific reference to the character of the plant. If a few good examples were set in this way, it would be impossible for Local Authorities to continue to blind themselves to the prospect that undoubtedly lies before them. We are not aware that any electricity supply undertaking in the United Kingdom is properly depreciated. The London Companies have done most in this way; but it is only very recently that they have closed their capital accounts, and their finances are complicated by founders' shares, and other incidents. The Local Authorities have a plain duty before them; and we wish it were possible to hope they would generally perform it, without needing to be stirred up by the Local Government Board.

So long as the Local Authorities keep up their sinking-fund payments, the central powers will have no further concern for the character of their undertakings. There is no sort of obligation upon an Electricity Supply Committee to make proper provision for the up-keep of their works and plant; and when the capital debt is cleared off, the whole thing may pass out of existence for all the Treasury will care. It would not be surprising if this were to happen in more than one case, where the amount of possible business is insufficient to make it worth while to keep the concern going. That is how depreciation will work out, in places. With old boilers, shaky engines, obsolete and patched-up dynamos, to say nothing of worn-out cables, the last days of some Electric Lighting Orders will be the reverse of joyous. It might not be difficult to lay one's finger even now upon some of the municipalized electric lighting establishments that are not likely to receive a second lease of life; but the temptation to anticipate Atropos must be resisted, out of consideration for the feelings of the friends of the victims. It is bad taste to talk about funerals and cremation in the house of the ailing.

An interesting paper on some points of calcium carbide manufacture has appeared in the "Zeitschrift für Elektrochemie." It gives some useful information as to the progress of this remarkable industry, which has sprung into importance so rapidly, after Willson's happy discovery. It appears that the hopes of those who fancied that the essential simplicity of Willson's process would mean eventually a cheap-and-easy manufacture of the carbide, were mistaken. The principle of the process is simplicity itself; but the operation of carrying it out in a rational and commercially lucrative manner is beset with difficulties. Still, a considerable amount of progress has been made in the manufacture; and it is stated that at the present time about 11 lbs. of carbide of calcium can be produced per kilowatt, which is a fair advance on early returns. A good deal of instructive experience has been obtained with regard to the crushing of the coke required for the manufacture. Those engaged in the business have learnt that coke-breaking is not a cheap nor a nice operation. The coke is broken at first in machines with reciprocating jaws, of the stone-crusher type. It used then to be ground in ball mills to a fine powder; and this was a dusty job, which gave a great deal of incidental trouble. The coke dust occasionally exploded; and this and the finely-ground lime were noxious to the workpeople. Now it is found that coke reduced to quite coarse grains, up to 25 millimetres (1 inch) diameter, and even larger, answers better than the flour; and it is desirable for it to be as free from dust as possible. Consequently, the ordinary crushing machines are sufficient. In addition, however, conical mills and spiral crushers are employed. These might be found useful in gas-works. The conical mill is on the same principle as a coffee grinder. A grooved cone of chilled cast iron revolves in a ring of the same material; the rubbing parts being easy to replace. The machine is therefore of very simple and safe construction, taking up little space, and being capable of reducing large coke to the size required. The degree of coarseness of the product is simply regulated by means of a handwheel, which makes the cone approach or recede from the ring.

WORKMEN'S BENEFIT SOCIETIES.

[FIRST ARTICLE.]

IN November last the Home Secretary appointed a Departmental Committee to "consider the complaints made by certain Friendly Societies that men are compelled by employers, as a condition of employment, to join Shop Clubs and to discontinue their membership of other Benefit Societies; and to ascertain if, and to what extent, the practices complained of exist, and whether any interference on the part of the Legislature is called for." The report of this Committee, together with the minutes of the evidence taken, have just been published.

The Committee was small and very business-like; the practical and useful nature of their inquiry being ensured by the appointment, as a member, of the indefatigable Chief Registrar of Friendly Societies, Mr. E. W. Brabrook, to whose very readable and valuable work on "Provident Societies and Industrial Welfare" we are indebted for much interesting information bearing

upon the subject under consideration. The other members of the Committee were the Right Hon. Jesse Collings, M.P. (Chairman), and Mr. H. H. Cozens-Hardy, Q.C., M.P. (now Mr. Justice Cozens-Hardy). The term "Shop Clubs," used in the warrant of appointment, is somewhat ambiguous; and the Committee preface their report by explaining that they have understood it to mean, and to include, any Club or Society instituted for providing sick or other benefits to workmen in connection with a particular workshop, factory, or other commercial undertaking, as distinguished from the public Friendly Societies, the qualifications for membership of which are of a more general character.

The terms of reference, and therefore to a certain extent the report itself, are restricted to a question of somewhat limited character and interest, the occasion of the appointment of the Committee being, primarily and mainly, the alleged hardship inflicted upon certain Friendly Societies, and also upon the workmen concerned, by the enforcement by one large firm of employers—the London and India Docks Joint Committee—of the conditions of employment above referred to. But the evidence given before the Committee introduced—or rather its perusal suggests to the reader—the whole question of the reasons for the institution (and the advantages and disadvantages) of the class of Society dealt with; and it presented, without always satisfactorily settling, some of the knotty questions which arise in the practical working of such Societies. In giving a brief *resumé* of, and commenting upon, the report and evidence, we shall direct attention especially to some of these points; and we shall hope to be of service, not so much by the expression of our own views thereon, but more particularly by eliciting from some of our readers the opinions they have formed in the course of their experience in the institution and management of such Clubs.

The Committee examined the rules of many, and called witnesses on behalf of several, Societies of varying constitution, connected with well-known commercial firms; while the arguments of the complaining Friendly Societies (which were not specified) were laid before the Committee, both verbally and in writing, by three witnesses delegated by those Societies to represent them. The Hon. Sydney Holland, as representing the London and India Docks Joint Committee (the rules of whose Society were, as we have said, especially in question), was naturally the most important of the witnesses; and it was especially fortunate that it should have fallen to him to present the employers' side of the question, as his interest in, and services on behalf of, the working-classes in the East-end are universally acknowledged. His evidence displayed throughout a desire to consider in every way the welfare and interests of the dock hands.

The Committee, then, had first to determine whether it was the practice of some employers to compel their men to join a Club instituted by them, and, further, to leave any other to which they formerly belonged; and, if so, to what extent those practices prevailed, and whether their existence was a substantial grievance. They report that such conditions of employment are laid down by the Docks Committee in the case of their permanent hands; and that, in several other instances brought to their notice, the first condition is enforced upon workmen without the second. But the Committee, while deeming it inexpedient that employers should be permitted to enforce the conditions imposed, under special circumstances, by the London and India Docks, state that they "have no reason to think that any widespread grievance can be proved. They are of opinion that Shop Clubs have not been established or used for the purpose of coercing the men, or of interfering with their independence, but have for their object the benefit of the workmen." We shall later on deal more fully with the action of the dock authorities; but we may say at once that the evidence given by Mr. Holland once more demonstrated the too often disregarded necessity of learning all the facts of a case before forming—and certainly before giving public expression to—any opinions and judgments thereon.

Proposed Legislation.

The next question for the consideration of the Committee was whether any legislative interference was called for. The witnesses on both sides were agreed—and we shall presently consider their reasons for holding—that an employer not only has the right to say, but is perfectly justified in requiring, that his workmen shall belong to some Provident Society. The representatives of the Friendly Societies (whose not unnatural jealousy of Shop Clubs was quite evident, in spite of their protestations of indifference) finally stated that they would be content with a mere enactment that it should not be lawful for an employer to impose as a condition of employment that workmen should belong to any particular Shop Club; but this suggestion did not receive the endorsement of the Committee. Mr. Holland was of opinion that it should be made illegal for an employer to oblige his workmen to belong to his Club, where the benefits of the Club ceased on the man's leaving the employment, or where the Club did not in other respects come up to a certain standard to be determined by the Registrar of Friendly Societies. The Committee, recognizing the force of the arguments advanced in favour of men being, under certain conditions, required to join Societies instituted for their benefit, proceeded to consider what requirements such Societies ought to fulfil before the employer should be allowed to make membership of it a condition of employment. They suggest—

(*a*) That the Club should be registered under the Friendly Societies Act.
(*b*) That it should be of permanent character.
(*c*) That it should afford to the workmen benefits of a substantial kind at the cost of the employer, in addition to those provided by the contributions of the workmen.
(*d*) That the conditions of insurance, taken as a whole, should be satisfactory, and calculated to be beneficial to the workmen.
(*e*) That quitting the service of the employer should not involve determination of membership of the Club, and thereby the loss to the workman so leaving of the benefits, for which he had subscribed, at a time when he might be too old to join another Society at all, or except upon much less favourable terms.

Being of opinion that compulsory membership should be illegal except in cases where the foregoing requirements are fulfilled, and recognizing that any enactment to that effect would be inoperative unless some practical means were provided by which compliance with these requirements could be tested, the Committee report that, in their opinion, the Legislature might properly interfere by providing—

1.—That it shall not be lawful for any employer to make it a condition of employment that any workman shall join a Shop Club; but
2.—That the foregoing provision shall not apply where the Shop Club (*a*) is a society registered under the Friendly Societies Act, and is certified by the Registrar of Friendly Societies to be one to which that provision should not apply, or (*b*) is established in conformity with a Private or Local Act of Parliament.
3.—That it shall not be lawful for any employer to make it a condition of employment that any workman shall discontinue his membership of any Friendly Society to which he belongs, or shall not become a member of any other Friendly Society.

With these conclusions we in the main agree; but we do not feel certain of the necessity for the proposed requirement that the Clubs, to be entitled to exemption, should be registered under the Friendly Societies Act. We think that the necessities of the case would be met by providing that exemption should be granted to all Clubs which were certified by the Registrar, after examination of their rules, to comply with the other requirements enumerated—in the same way as schemes proposed to be substituted for the provisions of the Workmen's Compensation Act have to be submitted to, and certified by, the Registrar. The same provision as is made in these cases for the revocation of such certificate—upon complaint and proof by the workmen that the provisions of the scheme are being violated, or that the scheme is not being fairly administered—could be made to apply to shop clubs. We raise this point because many employers object to registering the societies which they have instituted for the benefit of their men—partly on account of the cost of the quinquennial valuation thereby involved, but mainly because of the discredit reflected upon them should this valuation show, as such valuations frequently do show, a deficiency of some thousands of pounds. This may, at first sight, appear only a very strong argument in favour of registration; but on consideration of what such a valuation deficiency really means, it will be seen that the objection entertained by employers to submitting their Clubs (probably bearing the name of their firm) to the apparent indignity of being pronounced, *urbi et orbi*, deficient, is not always an unreasonable one. We cannot do better than give the Registrar's own words, in order to justify this objection. We quote from the book to which we have previously referred.

> When a valuer declares that a Society has a deficiency of so many thousand pounds, that is not the same thing as saying that somebody has embezzled so many thousand pounds of the Society's cash, or that its bank has broken, or its investments been depreciated to the same extent. It does not mean more than this: That if the Society continues to carry out its existing contracts without modification, and does not take any measures to improve its position, a deficiency will ultimately accrue, of which the present value is so many thousand pounds. Assuming that the Society took the heroic course of raising the money, which is rarely practicable, the result would be that, if the valuer's estimates should turn out to be confirmed by the actual future experience of the Society, and if the Society admitted no new members, the last member would receive the last pound, and the Society would work itself out. (p. 91). . . . . It must be borne in mind, however, that nothing is more elastic than the contract made by a Friendly Society with its members; no error more easy of remedy, if found out in time, than one existing in the original terms of such a contract. Hence the words 'insolvency,' 'rottenness,' and the like, which we sometimes hear freely used as describing the general condition of Friendly Societies, are utterly out of place (p. 93).

The chief object, then, of registration is to provide, by means of this quinquennial valuation, for the periodical examination of the financial prospects of a Society, with a view to revision, if necessary, of the rates of contributions or benefits. But in the case of Employers' Societies the possibility of financial disaster, arising out of short-sighted or improvident management, is almost invariably guarded against (or is speedily discovered and removed) by the fact that the employer is represented upon, and to a certain extent controls the governing body of the Society. The Friendly Societies' representatives sought to construe this control by the employers into a

grievance, as being an interference with the liberty of the members. But, when it is considered that, in the first place, the employer is usually a large contributor to the funds, and may, therefore, not unjustifiably claim to have some voice in the manner of their disposal, and further, that the advice of experienced men of business is invaluable to a body of men who cannot be expected to have the knowledge of accountants or actuaries, the supposed grievance is seen to be based upon imagination rather than upon experience. The presence, on the governing committee, of a society of men who have not to pay contributions to, nor are entitled to receive benefits from, that society, is found in practice to be a wholesome check upon the eagerness of the men to reduce the one and increase the other without due consideration or justification.

With the knowledge that his club possesses such a safeguard against ultimate insolvency, is it to be wondered at that an employer, who knows moreover that so soon as one member of his Society drops out from any cause another and a younger man will fill his place at the works and on the Club (a matter of certainty if the membership be compulsory, and of extreme probability in any case), and whose purse is always available in the last resort, should decline to risk what most people would consider to be the public disgrace of having his Club marked as rotten?

Considerable stress was rightly laid by some of the witnesses, and by the Committee, upon the necessity for the fifth of the conditions which they suggest should be required to be fulfilled by the club of any employer claiming to make membership thereof a condition of service—namely, that the rules of the club should not require a man to relinquish his membership thereof, or all interest therein, if for any reason at any age he be obliged to leave the service of the employer; and this stipulation will, we think, commend itself to everyone as common-sense justice. Mr. Holland was particularly emphatic upon the point. He said: "I think such a condition" (that benefits should cease on the determination of the employment) "monstrous. You have no right, under the pretence of encouraging thrift, to so bind the men to your employment." We are, further, disposed to consider such a rule an unjust one in any Employer's Society, whether membership be or be not declared to be compulsory; because the special advantages which such clubs usually hold out to men, and the fact that it is generally pretty well understood (if not actually stated) that the employer "prefers" his men to join, will in many cases induce them to become members—and to neglect to make any other provision against sickness or old age—without considering, even if they comprehend, the possible consequences that such a regulation may have to them in the distant future.

We will next proceed to discuss some of the more important of the questions that have occurred to us in considering the evidence and statements of the various witnesses examined.

ADVANCE IN INTENSIFIED GAS LIGHTING.

THE eternal wisdom of the adage that "good wine needs no bush," is being illustrated by the rapid progress of the system of intensified gas lighting upon the Somzée-Greyson principle. Those who love a good light, those highway authorities and caterers for the entertainment of the public who have no prejudices as regards lighting, beyond a liking for the best money's worth, and all friends of the gas industry will rejoice over the completeness of the mechanical equipment which has now been brought into use in this system. We recently described the gas lighting, upon the "intensified" principle, of the Marylebone Terminus of the Great Central Railway. The same principle is also carried out in an even simpler manner, so far as the automatic compression of the gas is concerned, by the patented appliances of the Water-Motor and Automatic Liquid Elevator Company, Limited, of Farringdon Avenue (Keith's patents). The accompanying illustrations show the external appearance of the new Keith's patent automatic air and gas compressors, as adapted to the service of the Somzée-Greyson intensified gas lighting system. It is no part of our duty to draw comparisons between, or pronounce judgment upon the various designs or makes of apparatus offered for the patronage of gas consumers. We can but extend an equal welcome to all deserving inventions of the kind, and leave our expert readers to make their own selection. It is unnecessary to repeat on the present occasion the leading data of the performance of the intensified principle of incandescent gas lighting given in our article of the 18th ult. Happily, there is no longer any dispute as to the competency of this system of lighting on a large scale to meet all the requirements of those who need a service of the kind. The average electric arc lamp is matched, and over-matched, by the triple cluster of intensified incandescent burners, using gas delivered at a pressure of from 8 to 10 inches of water, and developing an illuminating duty of 30 candles per cubic foot for the 10 cubic feet per hour consumed by each burner. This is the specification of the useful effect of these burners. Adding 100 candles for the reflecting power of the opal glass in the top of the lantern, we get a normal lighting effect of at least 1000 candles for the cost of 30 cubic feet of gas per hour, *plus* that of the water used for compressing it. The Welsbach mantles specially made for this purpose are stronger than the smaller ones, and last very well. There is consequently nothing for the intending user of the intensified system of incandescent gas lighting to concern himself about, besides the compressing arrangements.

These have presented certain difficulties. Some description of water-power compressor has been considered desirable, for obvious reasons. The next considerations are those of the quantity of water, and the pressure required. Not to go into these questions by the way of comparisons, let it suffice for the present purpose to state that Mr. Keith's claim for his new apparatus is that it uses only from 1 to 1½ gallons of water for every 10 cubic feet of gas compressed. According to this claim, the outlay for water need never be taken into account, as even at the present price of London water the cost only amounts to about 1d. per 1000 cubic feet of gas compressed. Moreover, the Water Companies raise no objection to this use of water, even if the waste goes directly into the drains. The water-motor works at any pressure down to 10 lbs. per square inch; so that a house cistern will answer the purpose. The smaller illustration (fig. 1) shows the extremely compact form in which the water-motor, gas (or gas and air) compressor, and governor are embodied. Both figures are drawn to a scale of a little over ¾ inch to the foot. Fig. 2 is a large size, showing the governor distinct from the motor and pump. The gas-inlet is at A, and the gas-outlet at B, in both cases. C is a drainage plug. There are pet-cocks to both patterns. No slide-valves nor packings are used. All the divisions are water-sealed, and there is no friction. The amount of compression is determined by the weighting of the bell of the gas-governor, which is done

FIG. 1.

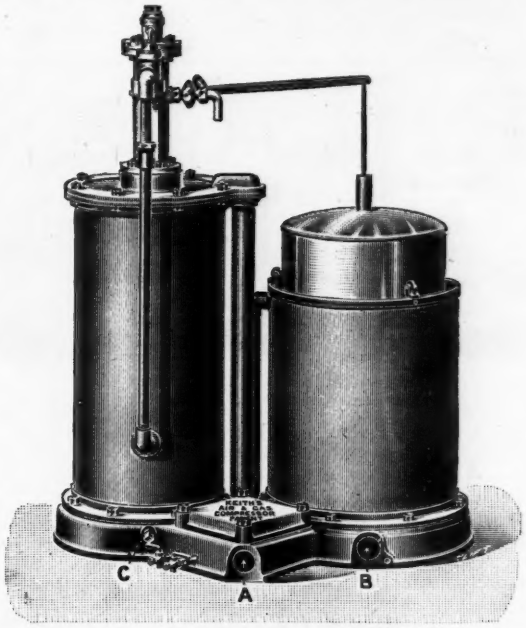


FIG. 2.

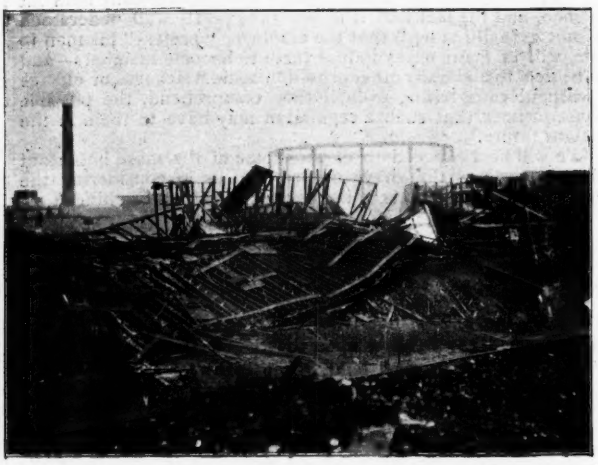
once for all by a heavy cast-iron ring at the bottom curb. There is no apparent movement, and no noise. The compressor starts with the turning on of the burner-cock; and the only visible evidence that the apparatus is working, besides the lighting effect, is the escape of a dribble of water from its proper outlet. There is no smell, nor pulsation. No anti-fluctuators on the gas-service are necessitated by this arrangement.

The smallest size of the Keith apparatus is only a little over 12 inches in diameter, and will therefore stand in any corner. Absolutely nothing else is required. Such a machine is capable of supplying from 100 to 150 cubic feet of compressed gas per hour, and therefore of keeping three or four 1000-candle power clusters of intensified gas-burners going—enough to make any corner public house the envy of its rivals. The second size apparatus will compress from 400 to 500 cubic feet of gas per hour, according to the available water pressure. The plant is in use for lighting the front of the Pavilion Music Hall, Piccadilly,

THE ST. HELEN'S EXPLOSION.

THE WRECKAGE IN THE WARRINGTON NEW ROAD. THE BOUNDARY WALL OF THE GASHOLDER YARD AND THE DEBRIS FROM THE VITRIOL CHAMBER.

THE SITE OF THE EXPLOSION. THE WRECKED GASHOLDER ABOUT 200 YARDS TO THE RIGHT FRONT. TAKEN AN HOUR-AND-A-HALF AFTER THE EXPLOSION.

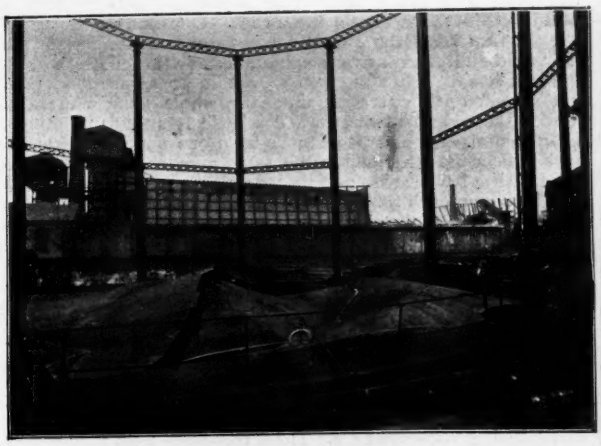


WRECKED GASHOLDER IN THE DISTANCE. THE DAMAGED VITRIOL CHAMBER IN THE MIDDLE DISTANCE FALLEN OVER IN THE DIRECTION OF THE HOLDER.

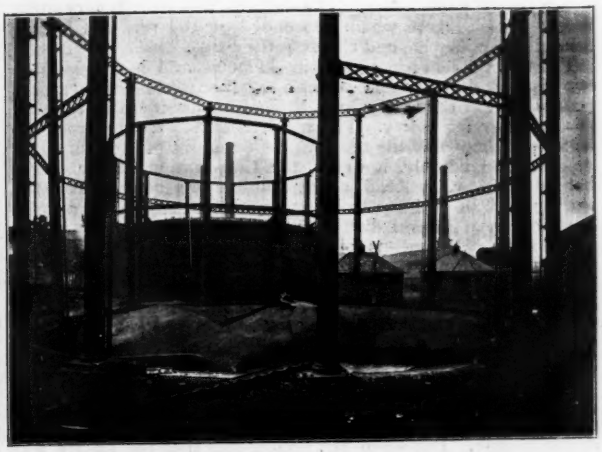
the Metropolitan Music Hall, Edgware Road, and elsewhere in London and the Provinces. The same plant is susceptible of many other applications in regard to gas lighting, besides that of the intensified gas lighting system of Somzée-Greyson. It can be adapted to automatically increasing the pressure of gas for any purpose, where the district pressure is low. Thus, the objection to maintaining an excessive pressure over a whole network of mains for the sake of one consumer may be overcome. Moreover, the difficulty of adapting oil gas to the incandescent principle of lighting, on account of the excessive richness of the gas, can be effectively dealt with by using a machine of this kind to forcibly inject a sufficient addition of air to "let down" the resultant mixture to a manageable candle power. For facilitating the combustion of acetylene gas, the same apparatus is readily adaptable to put both the gas and air under pressure. It is scarcely necessary to point out that Mr. Keith is no novice in this department of gas and hydraulic engineering; having long been identified with the cause of oil-gas lighting, the development of water-power motors, and so forth.

In due course, we shall publish the particulars of Mr. Keith's latest patent for "an improved apparatus for pumping or compressing and mixing gas and air." Meanwhile, it is to be remarked that the new form of apparatus now being manufactured for this application is the last step of a long progress which only now seems to have attained its mark. As we have already had occasion to observe, high-pressure gas distribution has become one of the unforeseen consequences of the success of the incandescent burner. While the only gas-burners in use were those which produced their best effect at very low pressures—not more than 5-10ths at the outlet—it was a point of practice to keep the pressure in the mains down to the nearest approximation to this minimum that would suffice to get the supply to the points of combustion. But to-day the condition of affairs is altogether changed. Gas-burners work at pressures that cannot be given by ordinary means. Mr. Keith has been working at water-power motors for blowing organs, lifting water, blowing fluid chemicals out of one tank into another, and all that sort of thing. There was nothing to indicate the probability that this accumulated experience would ever find a fresh application in the field of gas lighting. Indeed, all the best expert opinion inclined to the judgment that gas lighting with assisted pressure was a "No Thoroughfare." Not even the experimental success of the Somzée-Greyson method of producing a high-power gas lighting effect, sufficed to remove this impression; for the original compressing arrangements were objectionable. These involved working pistons with packed rods, tightly fitting in truly-bored cylinders; with all the concomitants of stuffing-boxes, gas-bags, governors, leaks, drips, smells of gas, and an expense for water exceeding the cost of the gas compressed. Mr. Keith simply claims to know better how to use water power for such a purpose. Neither will he have aught to do with india-rubber gas-bags, or leather gas-containers, or anything needing special

THE ST. HELEN'S EXPLOSION.



LOOKING IN THE DIRECTION OF THE EXPLOSION. CHIMNEY IN THE DISTANCE ON THE RIGHT IS THE SITE OF THE EXPLOSION —ABOUT 200 YARDS.



LOOKING AWAY FROM POINT OF EXPLOSION, SHOWING No. 2 HOLDER WHICH ESCAPED SERIOUS DAMAGE OWING TO PROTECTION OFFERED BY WRECKED HOLDER.

RIGHT-HAND SIDE OF WRECKED HOLDER, WITH INNER LIFT COLLAPSED AND CENTRE LIFT TORN AND DESTROYED.

LEFT-HAND SIDE OF WRECKED HOLDER, WITH INNER LIFTS COLLAPSED AND OUTER LIFT TORN AND DISTORTED.

ventilation or looking after. His success in cultivating the new field for the application of his familiar tool, the water-motor, is proved by the preference shown to his arrangement by the Intensified Gaslight Company themselves.

It is impossible to resist the conclusion that there is a very wide and brilliant future opening before this principle of high-power gas lighting, to which the present year has set the seal of practical, commercial acceptance. We are not concerned for the particular system, or pattern of apparatus, whereby this or that application of gas for the purpose of lighting is made. There can be no monopoly of ingenuity in this regard. But we do claim for gas itself, apart from the accidents of burners, blowers, lanterns, and everything else, that an illuminant capable of such a wide range of adaptability to the purpose sought, without loss of economy, is a resource of material civilization to be held in the highest possible respect. Nobody suspected the existence in common coal gas of these latent possibilities. Scientific persons, in the conceit of their knowledge, despised the gaseous product of the carbonization of coal which they so little understood, and proclaimed its imminent supersession in the interest of electricity, of which they knew even less. During the last fifteen years, all economical advance has been on the part of the "moribund" illuminant, which now, at the close of the century, manifests qualities in many respects unparalleled.

THE DESTRUCTION OF THE ST. HELEN'S GASHOLDER.

WE are able to-day, by the courtesy of Mr. S. Glover, the Engineer and Manager of the St. Helen's Gas-Works, to give our readers a much better idea of the extent of the damage caused to the gasholder there by the recent disastrous explosion at the adjoining chemical works, than we were in a position to do from the particulars to hand when the last number of the "JOURNAL" went to press.

The site of the actual explosion was about 200 yards away from the gasholder yard, and, as mentioned in our columns last week, the disturbance had to pass some vitriol chambers, which it levelled to the ground, before it reached the first holder, which bore the full force of the shock. At the time of the occurrence, it was about 45 feet up, and was protected by a boundary wall for about 8 feet from the ground. It was the general impression that the holder was struck and the plates fractured by flying fragments from the shattered buildings. A careful examination carried out by Mr. Glover since the removal of some of the water from the tank shows that the actual destruction of the holder was caused by the force of the explosion striking against the side of the top lift, which it blew into the tank about 10 feet—doubling up the roof truss, which is a very strong one, and ripping the crown open from one side to the other. The dip of the outer lift was broken in several places, and driven against the sides of the tank; the rivets scraping the coping-stone and tank guides as it descended. The whole of the columns have cracked off at the bases; those at right angles to the line of concussion being most disturbed, owing to the flattening of the holder just before it collapsed. The girders all remained in their places, except one of the intermediates right in the line of concussion. This, however, fell into the yard. It may be noted that the column guides are of wrought iron. Many of them were bent at the points where the guide-rollers were in contact at the time of the disturbance. The holder was originally a single lift, and about fifteen years ago it was telescoped; the original bases being retained, and the tapering columns lifted on the two parallel lengths introduced for the purpose of lengthening the columns. This may explain the way in which the bases have all broken, as they are not so strong as would be provided in the usual way for columns 60 feet high. Arrangements are being made for the re-erection of the columns with new bases and guides, and the construction of an entirely new holder, as the whole of the old one is hopelessly damaged; those parts which were not torn by the concussion being disturbed by having descended so quickly upon the rest-stones. The second holder felt the effect of the explosion in the same line, only to a very much less degree. The new steel plates which were put in only two years ago

show signs of having been disturbed, and one of the cast-iron column-guides is broken just below the bracket, where it was struck by the guide-roller. The damage, however, is very slight indeed; the timbers which descended on the roof not having caused any injury beyond charring the paint.

The two holders are 90 feet in diameter and 60 feet high, in two lifts; and they stand so near together that as the water is emptied out of the tank of one, it must be considerably lowered in the other for safety. The result is that Mr. Glover is left with only about half the range of the inner lift of the remaining holder. Fortunately, however, the Corporation have a larger holder at Knowsley Road, about a mile and a quarter from the works; and, in addition to being capable of supplying a large area from the general distributing mains, there is at the works an exhauster by means of which the holders there can be replenished should they need it faster than they can be by the gas as made. The area of supply is a very large one; the mains reaching far out into the country after having served the manufacturing and business centres. A new holder is to be put in hand at once to replace the one that was destroyed by the explosion.

The gas being made at the time of the accident was passing into the wrecked holder; and it continued to blaze after the stock of gas had been consumed, which took place in a very brief space of time. But when Mr. Glover saw that the holder was well down in the tank, and that there was no chance of further disaster arising by shutting off the gas, the valves were closed. He and his men were, of course, promptly on the spot; and they worked splendidly. Mr. Glover pays a tribute to the staff for their coolness and the promptitude with which they obeyed orders and did everything necessary. The work was all the more difficult from the fact that Manager and men were almost blinded by the dust and smoke, and suffocated by the gases liberated by the explosion. Soon after its effects had passed away, it was noticed that the starlings came back to the nests which they build year after year on the tops of the gasholder columns.

As will be seen from the views we give, the wrecked holder and its surroundings present a curious appearance; and the scene has been visited and the works inspected with much interest by several gas engineers. It is scarcely necessary to add that Mr. Glover has received many letters of congratulation from various parts of the country at the escape of his works from more serious disaster. As it is, the cost to the Corporation will be sufficiently heavy—something like £4000; and, of course, this will fall upon the town.

MOVING LARGE MAINS IN SERVICE.

In the "Journal" last week, we gave an account of the extensive alterations which have been carried out by the Chief Distributing Engineer of The Gaslight and Coke Company (Mr. G. F. L. Foulger) in the mains in the neighbourhood of the Mansion House, in consequence of the construction of the Central London Railway. Work of this kind must always have special interest for gas and water engineers; and therefore we reproduce, by way of supplement to the particulars furnished in the preceding issue, an article from a recent number of the "Engineering Record," illustrating the method adopted on the other side of the Atlantic for moving large mains while in use. It may be explained at the outset that the abolition of grade crossings on Pennsylvania Avenue, in the very heart of Philadelphia, made it necessary to lower the lines of the Philadelphia and Reading Railway for nearly two miles; and there has just been constructed for them, at great expense, a subway involving 6330 feet of open cut, and 2711 feet of tunnel work. This subway is crossed by no less than 32 gas-mains and as many water-mains—the largest of the former being 30 inches, and of the latter 48 inches in diameter—and they all had to be raised or lowered from their original position.

When the mains crossing the line of the subway required to be depressed, two general methods were adopted. In most cases where it was required that the flow of gas or water should be maintained, the old main was left undisturbed until a trench had been excavated sufficiently to one side to prevent accident. A new main was laid in the trench, and completed except at the ends, where special castings were employed to make the connections. When all was ready, the old main was cut and the connections were made. The main was then removed in the course of the excavation. In the case of the 48-inch mains, the work in making the connections usually occupied about 24 hours. When it was practicable to abandon the old main temporarily, it was cut, and the new line made on the old alignment.

When it was necessary to cross the subway below the level of the tracks, usually requiring a lowering of from 25 to 30 feet, the mains had the appearance of an inverted syphon; the connections between the high and low levels usually being made at an angle of about 45°, rounded off with special curves of about 15 feet radius. The maximum distance the main had to be raised to cross over the top of the subway did not exceed 4 feet. In such a case the main was usually supported on blocking and trestles, and carefully wedged up as the excavation was made. After the side walls had been built, the pipe-trench was opened for a sufficient distance on each side of the subway, and the main raised to the necessary height by screwing up suspension loops supporting it at every joint. This adjustment was made in a total length of 140 feet in the worst case. One man was stationed at each bearing of the suspension-rods, or two men for 48-inch mains; and all the nuts were simultaneously turned one revolution at a signal. Then the men moved to an adjacent section, and repeated the operation until the whole main had been raised; the end nuts being turned a little less than the others. Then commencing a short distance from one end, they worked back to near the other end in the same manner, and thus continued going backwards and forwards with a slightly diminished length of main each time until the main had been lifted to the required height at the centre. By this method a 48-inch main was raised 3 feet by 50 men in 15 hours.

The operation of screwing up a 48-inch main is illustrated in fig. 1, where two mains are shown crossing Pennsylvania Avenue. One of them is still supported on the low trestles which carried both of them across the excavation. A taller trestle was afterwards erected, and carried a pair of 18 in. by 24 in. lifting-beams parallel to, and on each side of, the nearest main, and above its final position. Pairs of 10-inch square cross-pieces were laid on top of these beams, and between each pair at either end was a vertical 1¾-inch screw rod by which the pipe was suspended, as shown in fig. 2. These rods were from 10 to 12 feet long, with a screw-cut 3 inches on the lower end, and on all but about 3 feet of the rest of the rod. There is a nut on each end; the upper one bearing on an 8-inch square cast-iron saddle-plate across the tops of the beams, and the lower one taking bearing on the underside of a 4 in. by 8 in. by 1 in. steel plate, which supports the shoulders of a pair of semicircular cradle-pieces made as shown in fig. 2. The bearing faces of the upper nuts and plates were smoothed and oiled, and they were turned with 3-feet steel wrenches.

In order not to obstruct the subway construction, trestle false-work was omitted from about 38 feet of these pipes, as shown at the left of fig. 1. While thus unsupported, there was a wreck on the railway on the bank above the skewback masonry. The tender of an ordinary freight locomotive was derailed, and fell down about 6 feet on top of this pair of pipes, and remained lying there, wholly supported by them for about three hours. This accident did not break the pipes or cause any considerable leakage under the water pressure of about 27 lbs. then carried; nor did it cause any serious displacement or distortion of alignment. Some leakage always occurred at the joints of the large pipes when they were raised or lowered; but it was usually negligible until the operation was completed, when it was remedied by recaulking. In some cases the mains have been carried across and beneath the subway in rock tunnels driven before the subway was excavated. Here, of course, the new pipe was laid in the tunnel, and the corresponding length of old pipe removed. Some of the mains were held up from the highway bridges crossing the subway; and there the suspended portions are at a higher level than the adjacent sections in the trenches, and are connected to them by special castings on easy curves.

The Fairmount Avenue main is 48 inches diameter, and just before it crosses the tunnel it divides into two 36-inch parallel branches which rise about 4 feet with a reversed curve, and after crossing the arch descend similarly, and again unite into a single 48-inch pipe at the grade. As there was not sufficient room for even the 36-inch pipes on top of the arch, grooves about 18 inches in maximum depth were cut for them in the brickwork across the crown, which had a minimum original thickness of 3 feet. This brought the pipe to the necessary depth below the surface, as shown in fig. 3. It is believed that the straight pipe itself would alone have been nearly self-sustaining without support between the subway walls, and that with the considerable arch action of the two reversed curves it would have no tendency to deflect after it was thoroughly settled in place, but would, on the contrary, be able to sustain any load likely to be applied to it. Therefore it was thought strictly proper to cut away a portion of the arch.

At the part of the city shown in fig. 1, an entirely different method was adopted under similar circumstances, where there was insufficient room to carry the 48-inch main between the top of the tunnel arch and the surface of the street. A length of about 18½ feet of the old main was removed on each side of the centre line of the tunnel, and replaced by two special sections reducing the diameter continuously to 30 inches, and so made that the upper side is nearly horizontal. This gave all the slope of the reduction to the bottom of the pipe, and brought it tangent to the arch near the crown. The two small ends of the reduced section were united by a double bell-piece 30 inches inside diameter and 16 inches long, into which both were caulked, as shown in fig. 4. The inside of the reducer pipe was bored smooth, and coated with hot coal tar, to diminish friction, and prevent obstructions lodging there. Piezometer tests showed that, with a velocity of 4·5 feet per second at the throat, the discharge was 14,300,000 gallons in 24 hours, and the loss of head 0·018 lb.; and with a velocity of 16·38 feet, the discharge was 51,900,000 gallons, and the loss of head 0·233 lb.

Except as noted, the changes in the water-mains were made by ordinary methods, and some of the gas-main crossings were similarly handled. At one street, a 20-inch gas-main crosses over the tunnel; and to avoid obstructing the steam-shovel

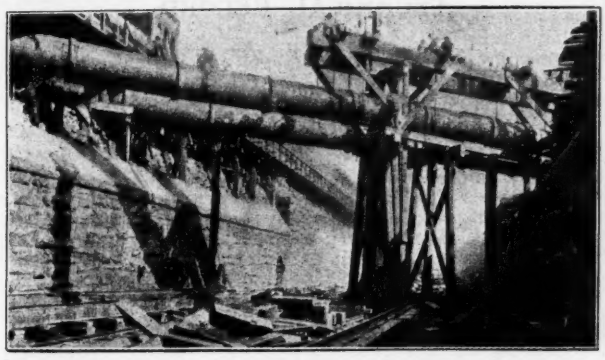


FIG. 1.—RAISING A 48-INCH WATER-MAIN.

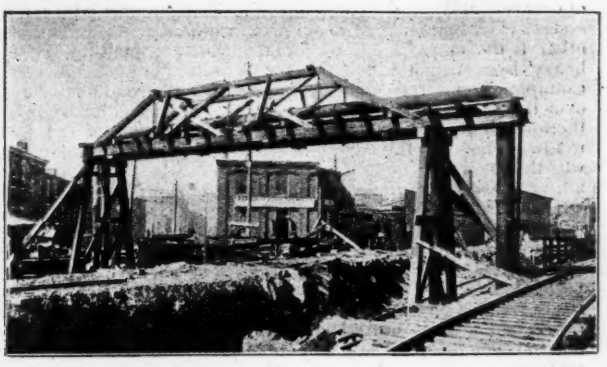


FIG. 5.—A TEMPORARY GAS-MAIN.

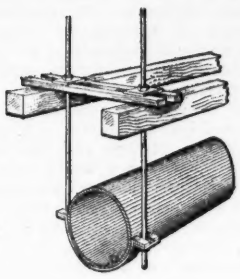


FIG. 2.

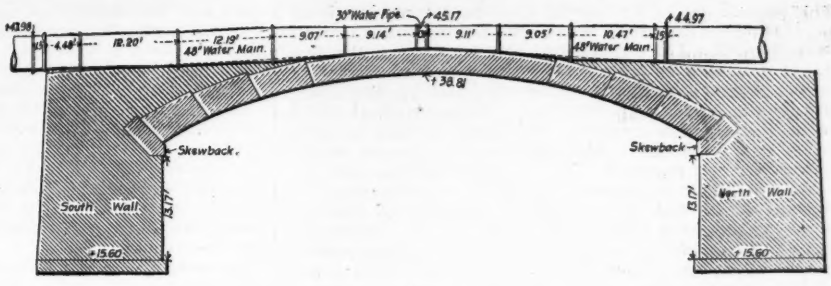


FIG. 4.

DIAGRAMS OF PIPE SLING AND CONTEMPLATED STREET CROSSING.

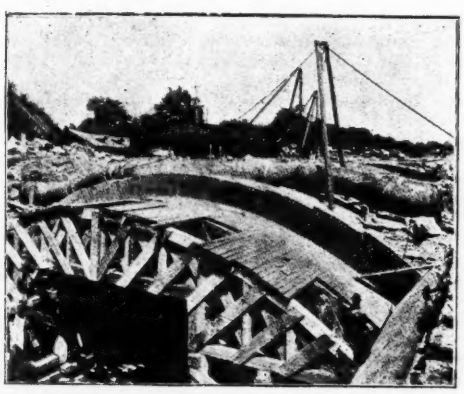


FIG. 3.—PIPES OVER ARCH.

used for excavation there, the main was, at the commencement of operations, elevated about 20 feet with a couple of 90° offsets, and a section 40 feet long was carried across overhead on a temporary Howe truss combination bridge of about 33 feet clear span, as shown in fig. 5. After the completion of the tunnel at this point, the main was lowered to its final position, resting on top of its masonry.

PERSONAL.

Mr. ROBERT J. SKINNER, Assistant Engineer at the Huddersfield Corporation Gas-Works, has been appointed Engineer and Manager to the Londonderry Gas Company, at a salary of £350 a year, with house, coal, and gas. Mr. Skinner, though still a young man, has had a lengthened practical experience of gas manufacture.

Mr. A. J. JENKINS, Assoc.M.Inst.C.E., who for the last three years has been assistant to Mr. C. H. Priestley, the Water Engineer of the Cardiff Corporation, has been selected out of a large number of candidates as the Deputy Borough Engineer of Burton-on-Trent. Mr. Jenkins was a pupil of Mr. J. A. B. Williams, of Cardiff; and after serving his articles was engaged for some time, under Mr. Baldwin Latham, at Bideford.

Mr. WILLIAM ROWELL, who has been Solicitor and Secretary to the Watford Gas Company for the past thirty-seven years, has resigned his appointment owing to illness. He was Solicitor to the Company previous to his appointment as Secretary, and has therefore been connected with the gas industry for more than forty years. During his tenure of office, the progress of the Company has been a constantly improving one; the annual make of gas having risen in that time from 7 millions to upwards of 100 millions a year, while the price has been reduced from 6s. to 2s. 10d. per 1000 cubic feet. The present prosperous condition of the Company fully testifies to Mr. Rowell's care and business aptitude; his whole time for the last fifteen years having been devoted to the interests of the Company. In consideration of his long and faithful services, the Directors have unanimously granted him a very substantial retiring allowance. He has been succeeded by Mr. J. DUNCAN ROYAL (formerly of Arbroath), who joined the Company's staff about two years ago. [Since the foregoing was in type, we have learnt, with regret, that Mr. Rowell died last Thursday morning, in his eightieth year.—ED. J.G.L.]

NOTES.

New Use for Tar-Oils.

A use for tar-oils, or non-volatile petroleum oils, has been found in spraying the ballasting of some much-used railways in the drier regions of the United States. The approach of the tourist season in this country, with its regular repetition of dusty travelling between London and the North, lends particular interest to the American remedy for this annoyance. It is reported that the cure, which was probably first suggested by the clean working of the oil-sodden railway tracks in and about the oil regions, has proved most satisfactory. If tar-oils become more of a drug in the market, here is an outlet for a large quantity. The application is effected at the beginning of summer by means of a special van, which consists of an oil-tank and an atomizer. Enough oil is scattered in the first place to penetrate the ballast to the depth of about four inches, which has the secondary effect of destroying vegetation as well as preventing the dust from rising with the passage of the trains. The consumption of oil for this purpose is put at about 2000 gallons per mile of single track for the first application. A lighter dose afterwards serves to keep the ballast in good order. Further information as to the working of the system is desirable; but it is pretty certain that a passenger railway which could be warranted not to be dusty in the driest season would be a boon to travellers, who are accustomed to wish for rain whenever they are compelled to pass through the "Black Country."

Reinforced Concrete Construction.

The fashion of reinforced concrete construction is spreading. This is the generic term applied to all combinations of portland cement concrete and metal. The possibility of using iron or steel advantageously in combination with concrete depends upon certain fundamental qualities of both materials, the existence of which has been experimentally proved. These properties are: (1) That the coefficients of expansion of iron and portland cement are practically equal at ordinary temperatures; (2) that cement adheres strongly to iron; (3) that concrete possesses sufficient elasticity to permit of its stretching, without cracking, far enough to enable the tensile strength of the embedded metal to come into play. Various systems of effecting the combination

of concrete and metal are advocated. The Monnier wire-mesh system is at one end of the scale of reinforcement; and at the other is the employment of actual girders, or built-up ties of heavy iron, round which the concrete is moulded. A good example of reinforced concrete construction is the double bridge over the River Sarthe, at Mans. The plan of this bridge is in the form of the letter X; the point of intersection of the two roadways being in the middle of the river. Extreme cheapness was the essential condition of this bridge being constructed at all, as it was only intended to carry a couple of local railways which could not bear a heavy capital outlay. The bridge was built of concrete, reinforced with old steel railway metals. The foundation of the piers was a grille of old metals buried in concrete. Upon these were raised piers of concrete, containing vertical metals. The superstructure consists of built-up girders, resting on the piers, with cross flooring beams of old metals, and concrete flooring. The whole forms a strong, effective, and substantial structure, and cost only 66 frs. per square metre of bridge surface.

The Liquid Air Fallacy.

The perpetual motion monomaniac has broken out in a fresh place. Having exhausted the field of mechanics, he has made a raid into the domain of physics, and has seized upon the new article of manufacture, liquid air, as means of achieving the impossible. Fittingly, it is in the land of the Keely motor that the liquid air juggler has first appeared, although the article itself was originally produced in this country. The American public have been amused and amazed at the performances of an ingenious person named Tripler, who has produced a liquid-air engine which is claimed to make 10 gallons of the fluid at one end of the chain of causation by the consumption of 3 gallons of the same liquid at the other. Obviously, at this rate the adaptation of liquid air to drive engines and do most of the other work of steam and carbonaceous fuel is merely a question of time, and not a long time either. Professor Henry Morton, of the Stevens Institute of Technology, has exploded this liquid air fallacy. As a matter of fact, a 50-horse power engine is capable of producing 50 gallons of liquid air per day of ten hours. Liquid air expands to 800 times its volume in passing from the solid into the gaseous state—that is to say, it has about half the expansive force of steam. Applying the well-known and generally accepted formula for a gas expanding at a constant temperature, 1 lb. of liquid air in expanding 800 times will develop about 190,000 foot pounds of work. As 1 gallon of liquid air weighs about 8 lbs., this would give eight times as many foot pounds, or 1,520,000, which if accomplished in an hour, would represent almost exactly ½-horse power, supposing an ideally perfect engine. Inasmuch as this quantity of liquid air requires 10 horse-power-hours to produce, it follows that the manufacture of a gallon of liquid air takes twelve times the power that it could possibly return if made to work an ideally perfect motor. At this rate, as Professor Morton remarks, it does not look as if heat obtained from the atmosphere, and operating an engine by the aid of liquid air, is likely to become a dangerous rival to the coal mine.

The Durability of Wire Ropes.

The subject of the durability of wire ropes was brought before the United States Engineering Association in a paper by Mr. W. Hewitt, who confessed to having been frequently asked how long a particular wire rope may be expected to last. This is a difficult question to answer satisfactorily, as the life of a wire rope may be affected in a variety of ways—as, for instance, by the duty performed, the care taken of it, the amount and degree of bending it gets, its exposure to water, and more especially to water containing salts and acids. The principal causes of wear are abrasion and excessive bending strains. Abrasion results in the flattening or tearing apart of the wires; while undue bending is manifested in the fracturing of the outer wires at the wearing points. More wire ropes are worn out from undue bending than from abrasion, owing to the fact that want of space very often forbids the use of sheaves of the proper size. For good results, of course, the bending strain, added to the direct tension due to the load, should not exceed the elastic limit of the wires. In practice, the strain due to the bending is often considerably greater than that attributable to the useful effort or load. Consequently the size and proper disposition of the sheaves used should be carefully considered in any wire-rope installation. The transmission of power by wire ropes is effected under the most favourable conditions when the useful effort is one-third, and the bending strength two-thirds, of the elastic limit of the material. It appears from an examination of the tabulated dimensions of pulleys and ropes, for iron and steel, that the former requires larger sheaves than the latter. This proceeds from the fact that iron wire, while having the same modulus of elasticity as steel, has but half the ultimate strength. The angle made by a wire rope in bending is also an important consideration. It has been stated that the degree of bending is immaterial—in other words, that the tension due to bending will be the same whether the rope merely touches the sheave or wraps all the way round it. The truth is that the curvature depends upon the tension; and it is possible to run large ropes round comparatively small sheaves when these are placed so close together that the bending angle of the rope on each is so small that the resulting curvature does not overstrain the wires.

TECHNICAL RECORD.

INSTITUTION OF CIVIL ENGINEERS.

Second Engineering Conference.

It will be in the recollection of our readers that two years ago arrangements were made by the Institution of Civil Engineers for holding a conference of members, with the object of bringing forward subjects for consideration by those who were precluded from attending the ordinary weekly meetings. This innovation by the Council was in every respect a success; and it was decided that these gatherings should be biennial. We have received from the Secretary of the Institution (Dr. J. H. T. Tudsbery) the programme of the forthcoming conference, which will be held from the 7th to the 9th prox. The subjects will, as before, be introduced by short "Notes," prints of which will be available a few days before the meetings. Accommodation has been courteously placed at the disposal of the Council by the Institution of Mechanical Engineers, the Surveyors' Institution, and the Middlesex County Council. The reading and writing room of the Institution of Mechanical Engineers, Storey's Gate, will be open to members attending the conference; and the Honorary Secretaries' office, for inquiries, &c., will be at the Surveyors' Institution.

The business will be divided into seven sections, of which Mr. W. H. Preece, C.B., F.R.S., will be President: (1) Railways; (2) Harbours, &c.; (3) Machinery; (4) Mining and Metallurgy; (5) Shipbuilding; (6) Water-Works, Sewerage, and Gas-Works; (7) Applications of Electricity. Sections 3, 6, and 7 are those in which our readers will be most interested. Sir James Kitson, Bart., M.P., will be the Chairman of the first, Mr. G. H. Hill of the second, and Dr. A. B. W. Kennedy, F.R.S., of the third. The meetings of the Machinery Section will be held at the Institution of Mechanical Engineers on the 7th and 9th; those of the Gas and Water Works Section, in the Council Chamber of the Guildhall, Westminster, on the 8th and 9th; those of the Electricity Section on the 7th and 8th—the former at the Surveyors' Institution and the latter at the Institution of Mechanical Engineers. All the Sections will be addressed by the President. In the Machinery Section, Mr. T. Parker will introduce the subject of "The Relative Advantages of Different Kinds of Power for Tramways, Light Railways, and Motor Car Traffic;" Mr. A. Greenwood, that of "Machine Tools;" and Mr. W. Pitt, that of "Cranes and the Power to be Used with Them." In the Gas and Water Works Section, Mr. W. Foulis will deal with "The Purification of Gas and the Conversion of Chemical Residuals Therefrom, including the Preparation of Cyanogen;" Mr. C. C. Carpenter will endeavour to elicit the views of the meeting on "Labour-Saving Machinery applicable to Operations in Gas-Works;" Mr. M. W. Hervey, Engineer of the West Middlesex Water Company, will introduce the subject of "The Use of Filtered Flood Water;" Mr. J. Watson, Water Engineer of the Bradford Corporation, that of "The Rate per Head of Supply in Different Towns;" and Dr. G. Sims Woodhead, that of "Sewage Sludge Disposal by Natural Agencies." Among the subjects to be dealt with by the Electricity Section are: "Mechanical Traction by Electricity," to be introduced by Mr. G. C. Cuningham; and "The Economical Transmission and Distribution of Electricity from a Distance," by Mr. H. F. Parshall.

In connection with the conference, arrangements have been made for visits to works. On the 7th, members interested in water supply will have an opportunity of inspecting the large reservoirs now in progress at Staines, and the works of the East London Water Company at Lea Bridge and Walthamstow; on the following day, Messrs. W. Cory and Sons' works for dealing with seaborne coal, and the stations of the London Hydraulic Power Company and the Westminster Electric Supply Corporation will be visited; while on the 9th, the works of The Gaslight and Coke Company at Beckton, the Metropolitan Sewage Disposal Works at Barking, and Messrs. Siemens Bros. and Co.'s works at Charlton will be open to visitors.

THE MAY MEETING OF THE SOUTHERN DISTRICT ASSOCIATION.

The Meeting of the Southern District Association on Thursday last was one of the pleasantest and altogether most successful in the annals of the Society. The programme was an inviting one; and the best of May weather favoured its realization. The proceedings began with a visit to the works of the Tottenham and Edmonton Gas Company; the numerous party being conducted over this very business-like establishment by the President, Mr. E. A. Broadberry, who is associated in the management with his father, Mr. W. H. H. Broadberry. The Chairman of the Company, Mr. Corbet Woodall, and another director, Mr. D. Ford Goddard, M.P., were present at this part of the function, and the lunch which followed, to do the honours of the district to the members of the Association. The compliment was highly appreciated; and the honourable member for Ipswich, as an old Gas Manager, seemed delighted to find himself once more in such congenial company. The undertaking

of the Tottenham and Edmonton Gas Company is a remarkable example of growth and development, corresponding to the enormous increase of population of the district. The management are to be praised for the good order and neatness which have been preserved in the works under the trying conditions of something like a 20 per cent. annual increase. The large carburetted water-gas plant is one of the specialities of these works; and it is difficult to see how the requirements of the district could be met if any restriction were placed upon this manufacture.

After luncheon, which was provided by the hospitality of the directors of the Gas Company, the party left in breaks for the Royal Small Arms Factory at Enfield, where the art and mystery of making those deadly weapons which have carried the British flag so far was duly admired. It was a most absorbing, but "headachy" place. From here the breaks conveyed the party through pleasant ways to the Royal Forest Hotel, Chingford, for tea. Subsequently a little formal business was transacted, consisting of the election to membership of the Association of Mr. J. H. Brown, of Ilford, and Mr. W. Wyver, of Whitstable. This being the first meeting of the Association after the lamented death of Mr. Frank Livesey, whose interest in the organization was unfailing, a vote of condolence with the bereaved family was passed. The party then separated, mostly returning to London by an early train; and so concluded a well-filled and happy day.

The Secretary of the Tottenham Company (Mr. James Randall) circulated among the members the following statement in regard to the prepayment system in vogue in their district:—

Average Cost of Fitting Up each House for the Supply of Gas by the Prepayment Meter System.

1-inch wrought-iron service-pipe from main to meter laid by Company's own men, including ¾-inch brass main tap, cap, and lining and fixing inlet only of meter	£0 18 0
Contract with gas-fitters for supplying ¾-inch, ½-inch, and ⅜-inch wrought-iron piping, and fixing same for five lights and boiling-burner	1 1
Fittings supplied by Company: Two brackets, 2-light pendant (brass), one iron do., and one boiling-burner, net cost	0 17 0
3-light automatic dry gas-meter, net cost.	2 4 0
Total	£5 0 0

The expenditure to the 31st of December, 1898, for providing and fixing piping, gas-fittings, and boiling-rings, fitted in consumers' houses supplied by the automatic gas-meter system, including experimental free gas cooking-stoves (£76 3s. 8d.) was £12,327 10s. 11d. This amount has been transferred from capital (fixed plant account) to a separate account, and will be a charge, by instalments, against revenue as opportunity occurs. In addition to the amount charged for the ordinary repair of gas-meters, 5 per cent. is allowed for depreciation.

Statistics of Automatic Gas-Meters for Five Years and Four Months.

Selling price of gas by ordinary meter, 3s. per 1000 cubic feet; do. by automatic meter, 3s. 8d. per 1000 cubic feet.

Years.	Part of 1893.	1894.	1895.	1896.	1897.	1898.
Number of consumers.	67	1,250	2,658	4,323	5,740	7,024
Total consumption . . . . . cub. ft.	238,100	8,372,000	26,282,200	43,129 900	64,323,600	85,880,400
Average consumption per consumer ,,	3,554	6,698	9,888	9,977	11,206	12,226
Value of gas at 3s. per 1000 cubic feet	£41 3 6	£1,392 18 2	£4,328 13 5	£6 514 18 1	£9,729 3 4	£12,883 5 5
Apportioned for meter-rent	2 13 7	161 6 10	491 9 0	900 0 5	1,274 15 2	1,622 0 0
Apportioned for rent of fittings (balance) . . .	Not allocated.			£567 14 4	£952 2 4	£1,525 3 4
Total amount taken from meters	£43 17 1	£1,554 5 0	£4,820 2 5	£7,982 12 10	£11,956 0 10	£16,030 8 9
Rental of cooking-stoves	0 1 8	7 5 11	18 2 3	76 7 7	129 19 6	182 8 10
Total rent—gas, meters, stoves, and fittings . .	£43 18 9	£1,561 10 11	£4,838 4 8	£8,059 0 5	£12,086 0 4	£16,212 17 7
Average amount taken from meter per consumer	£0 12 11	£1 4 10	£1 16 3	£1 16 11	£2 1 8	£2 5 7

OBSERVATIONS ON GAS-PIPES.

The following observations by "R." on the above subject appeared in the "American Gaslight Journal" for May 1.

Leaks in gas-pipes are due to a number of mechanical defects in adjustment and plan, some of which will be described. In section drums which are connected by nipples to cross boxes or saddles, the boxes are manufactured either of flanged steel plates or of cast iron. Both of these are improper. If made of cast iron, it is impossible to have the curvature of the box conform exactly to the curvature of the drum; and when they are riveted in place, one of three things must occur: (1) the sheets on the drums are distorted, (2) the cast iron is cracked from the pressure, or (3) a leaky joint is made. The leaky joint is the most frequent result. When the inspectors find this, they

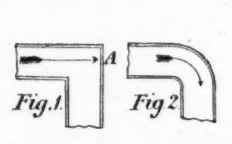


Fig. 1.

Fig. 2.

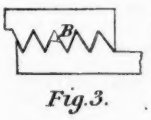


Fig. 3.

Fig. 4.

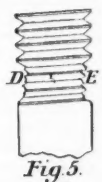


Fig. 5.

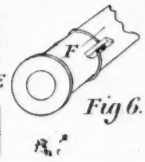


Fig. 6.

Fig. 7.

Fig. 8.

generally attempt to caulk up the space with various metals; lead or Babbitt's metal having been used in many cases, with the result that might be expected. After the connections have been tested, the metal melts out, and serious and irreparable leaks develop. Again, leaks may be due to the frictional wear of the gas on the interior of a sharp elbow. The force of the current of gas is received at A (fig. 1), and in time the elbow is worn so thin at the point that a leak is developed. This difficulty is overcome by using round elbows, as in fig. 2.

Defects in Threads on Gas-Pipes.—Defective threading on gas-pipes is, of course, a common cause of leakage of gas. At the same time much good piping is known to be discarded simply because of a slight defect in the thread which would not produce a leak. The general run of gas-fitters will discard material on account of the threads being a trifle flat. If one will examine into the matter closely, he will find that often the thread is defective only at one place, as at B (fig. 3). Where it is flat, no leakage will occur, for the reason that practically the entire thread on the pipe must be flat in order to conceive of a leak being produced, and then the leak must traverse the circumference of the pipe as many times as there are threads in the contact. It is taken for granted that lead will be used on the threadwork of a joint. In the writer's experience, it has not been so much that leakage in gas-pipes was due to a few flat threads in connections as to poor fitting of thread-work—such, for example, as using threads which do not harmonize in the gauge.

Grooved Threads.—It is quite a delicate operation to class as perfect or imperfect pipes on which the threads are grooved. Small grooves sometimes occur in threads, due to the weld not being perfectly brought up. If the groove runs nearly the whole length of the threadwork, as at C (fig. 4), the pipe should be rejected; but if the groove extends only over a few threads, it will be seen upon a little reflection that this groove could not produce a leak unless it ran the entire length of the thread contact, and in depth went below the bottom of the thread.

Broken Threads.—Another cause of rejection of pipe material is where the threads have been broken off a little. Probably not as much as 1 per cent. of the whole bearing of the thread is gone, yet the fitter may deem it advisable to reject the piece. A few broken threads in gas-pipe connections need not necessarily affect the joint, unless the defects are of such a nature that the mechanical action due to the movement in all fixed parts will increase the breakage. When the pipes come in contact with water, the scaly incrustations which are developed will in time eat into the threads of the joint at that portion which is unprotected, and destroy the threadwork completely, as at D and E (fig. 5). Defects of this sort are far more dangerous than a few broken threads, for the reason that the incrustation increases with time, and eventually the metal is so far gone that leakage occurs. The preventive for this corrosive action in the waters is afforded in various ways. Soda ash and other alkalies are very useful in waters containing sulphate of lime, by converting it into a carbonate, and so forming a soft scale easily cleaned. Petroleum has been much used of late years. It acts best in waters in which sulphate of lime predominates. As crude petroleum, however, sometimes helps in forming a very injurious crust, the refined only should be used. Milk of lime and metallic zinc have been used with success in waters charged with bicarbonate of lime; reducing the bicarbonate to the insoluble carbonate. Barium chloride and milk of lime are said to be used with good effect for waters impregnated with gypsum. Molasses, cane juice, vinegar, fruits, distillery slops, &c., have been used

with success so far as scale is concerned, by reason of the acetic acid which they contain; but this is even more injurious to the iron than tannic acid, while the organic matter forms a scale with sulphate of lime when it is present. Oak, hemlock, and other barks and woods, sumac, catechu, logwood, &c., are effective in waters containing carbonates of lime or magnesia, by reason of their tannic acid, but are injurious to the iron, and not to be recommended.

As to the Valves.—Valves in gas-piping frequently leak through wear of the parts. If the stem-pieces of the valves are badly scored they should be turned off, the glands brushed, and new neck-rings made. With attention and proper fitting, a great deal of future trouble can be avoided. If when moving the stem a gritting is heard, its results will be seen by creasing or scoring the rods. Leakage of valves in gas-piping systems is indicative of waste and shiftlessness. Nine times out of ten grinding the seat of the valves effects a cure. A light grinding of the seat with a tool which is specially made for the purpose will not spoil any valve. A man may grind too much, and so the seat will be worn. Some men will almost grind a tool away before they get in working order. And it will be the same in grinding valve-seats. A few light touches accurately applied will do their work quickly and correctly.

Closing a Split in a Pipe.—It is sometimes necessary to clamp a cracked gas-main during street operations. Fig. 6 shows a simple and quick method. A single rod of iron is cut with threads at each end, and, after wrapping it around the pipe over the crack F, nuts are provided for tightening the sides in the manner shown. Recently one of the mains in a plant sprung a leak. As it would not do to shut down for a day to put in a new joint, the old pipe was patched with a clamping arrangement, which answered the purpose so well that we never removed it. We used a cup and plunger flange of an old friction pulley; filling the bowl with clay and red lead, and squeezing the same together with bolts. Of course, the tighter we made the bolts, the tighter we brought the clay upon the pipe, thus stopping the leak.

Gas-Pipe Hooks.—Hooks for supporting pipe-brackets should not be designed as in fig. 7, for the reason that the strain falls chiefly upon the back of the hook, often resulting in breaking the back at G, as shown. Fig. 8 is a specimen of a more positive bracket-hook, for in this form of hook the downward strain at J is supported firmly by the increased depth of the back at H and I. Hooks of this sort are reliable.

Rivet Work.—To make a strong seam in rivet work for gas apparatus we must use rather large rivets, spaced far apart, and put in several rows of them. In fact, the rivets should be placed as far apart as the plate will allow caulking to be done between the rivets without springing the plates. Putting the same diameter of rivets farther apart increases the plate section percentage, while increasing the pitch and diameter so that the spaces between the rivets remain the same, and has the effect of decreasing the plate section percentage, because the plate section remains the same while the width of the strip of plate is increased. Having found the right pitch and diameter for the rivets, there now remains the laying of them out on the sheet. If we space the two rows evenly apart, and put one row squarely behind the other, we do not have the conditions of the greatest strength. To get this we must "stagger" the rivets, so that the distance from one in a certain row to the next rivet in the next row will be equal to the pitch of the strongest single riveting. This may be figured as follows: The greatest strength of single riveting is when the plate section equals the rivet section. The latter area is 1·36 to obtain an equal plate area. The pitch must be 1·36 + (1·3125) = 2·6725, about 2⅝ inches. This, then, would be the pitch for single riveting. It brings the rows within a trifle less than 2⅝ inches of each other; and it will be seen that the intermediate rivet is able to strengthen the caulking edge of the plate a good deal.

UNIQUE WATER-WORKS.

A recent number of the "Engineering Magazine" contained the following account, from "Le Génie Civil," of some small water-works which have been constructed at the little seaside village of Yport, on the French coast of the Channel, which possess features of peculiar interest. The source, or rather sources, of the supply are a series of springs, situated on the pebbly beach at the foot of the chalk cliffs, and entirely covered by the sea to a depth of more than 10 feet at high tide. As the tide falls, water flows up, forming bubbling pools several yards in diameter, like the discharge of a submarine river through the gravel of the beach. The water from these springs has been entrapped in small intake reservoirs built in the rocks, protected against the entrance of sea water, and filled by the fresh water as the springs are uncovered by the falling tide. As the beach is close to the foot of the cliffs at this point, and the town lies back in a hollow among the rocks, the water must be delivered to a reservoir upon the higher part of the cliffs. This is accomplished by piercing a short tunnel into the face of the cliffs opposite the intakes, and constructing a vertical shaft to the upper surface of the hill. A chamber excavated in the chalk about the middle of the tunnel contains the pumping machinery, which draws the pure spring water from the intakes, and forces it to the reservoir 250 feet above. There are two sets of pumps, driven by vertical petroleum motors. The pumps are geared to the motor shafts; and the whole arrangement is compact and symmetrical. The pumps can be thrown out of gear while the motors are being started, and gradually engaged with the works by means of friction clutches. From the nature of the supply, the plant can only be operated for a portion of the time; the most satisfactory results being obtained at about half tide. It is found that pure water can best be obtained by two pumping periods per day, of six hours each, at times midway between high and low tide, although experience has shown that in stormy weather, when the tides may be higher than usual, the agitation of the surface prevents the salt water from sinking into the pits, and fresh water is drawn by the pumps even when the springs are covered by several feet of sea water. With the plant as at present arranged, a supply of pure water of about 60 gallons per head per day is readily obtained, while the installation of another pumping engine would enable this to be proportionately increased without difficulty; the flow of the springs being ample for an increase of population.

Yport has for long been looked upon with considerable favour as a seaside resort, lying as it does between Fécamp and Etretat; but until now the absence of a satisfactory water supply has prevented it from becoming popular. The present works remove entirely any objection on this score; and both as a neat solution of an engineering problem, and as a municipal improvement, this little installation is well worth noticing.

REGISTER OF PATENTS.

Extracting Cyanogen from Coal Gas.—Bueb, J., of Dessau, Germany. No. 9075; April 19, 1898.

This invention relates to the extraction of cyanogen from coal gas by reactions described in Knublauch's patent No. 15,164 of 1887, and also in a United States patent (No. 465,600) granted to William L. Rowland, according to which "the cyanogen is separated from coal gas in the form of a double salt or compound, by means of iron, and of alkalies, or of the ammonia contained in the gas itself."

The compounds of ferro-cyanogen and ammonia exist in two forms, the present patentee remarks: As soluble compounds, and as insoluble compounds; the latter differing from the former in that iron is substituted in them for part of the ammonia, as these insoluble compounds form where, in the production of the salt or compound, the quantity of iron present is greater than that required for obtaining the soluble salt. Hitherto endeavours to carry out these reactions have been directed to obtaining the double salt or compound, in the form of a solution, because any insoluble product that might occur would cause clogging of the purifying apparatus, and so interfere with the practical working at the gas-works. It was, therefore, considered necessary to deal with the salts or compounds in the form of a solution, with a view to their ultimate utilization; and the process was not satisfactory, owing to the large quantities of dilute solution to be dealt with.

The object of the present invention is to overcome these objections by conducting the process so that insoluble products are formed and separated from the gas before it passes to the ammonia-scrubbers; and it differs from methods hitherto proposed, in that it does not hinder the formation of undissolved products—the production of such undissolved products being its main object.

The specification is not illustrated; but the following detailed description of his plant is given by the patentee: There is arranged between the cooler or tar-separator and the ammonia-scrubber, a chamber containing a highly concentrated solution of an iron salt—such as ferrous chloride and ferric sulphate. The scrubber is fed with water or dilute gas liquor, in the usual way. The highly concentrated iron-salt solution, with the assistance of the ammonia which, at the stage at which the gas comes into contact with the iron salt, is present in the gas, compels the whole of the cyanogen contained in the gas to separate in the form of an insoluble precipitate. The chamber, therefore, acts practically as a filter, by which the insoluble salts or compounds formed are separated, so that they do not pass to the scrubbers. By using a solution of the soluble salt of iron of sufficient concentration, practically all of the cyanogen present will be obtained in the precipitate. If the soluble salt of iron be not of such concentration as to cause the whole of the cyanogen to be obtained in the precipitate, any double salt of cyanogen which may still be left in the dissolved condition may, if desired, be brought to the insoluble state simply by boiling the solution without any further addition of chemicals. The degree of concentration of the iron-salt solution employed may vary within wide limits; but it should under no circumstances be so low as to yield the double salt, or the main part thereof, in a dissolved form. In carrying out this process, in practice, solutions of a concentration of from 10 to 20 per cent. and upwards have given satisfactory results; but a solution of even as low a concentration as 3 per cent. will be serviceable.

The ammonia which has not entered into reaction passes off with the gas into the ammonia-scrubber proper, and is separated in any suitable way; any chemical combination tending to the formation of mud and the clogging of the scrubbers being avoided. By energetically boiling the muddy matter obtained (without the addition of any substances exercising a chemical action), and separating by mechanical means any solution therefrom, a product is obtained which can readily be converted into marketable cyanogen compounds. The dissolved ammonia salts remaining in the separated solution can be liberated by evaporation.

In practice, it is preferred to employ two or more chambers, containing the iron-salt solution, so that, by means of suitably disposed valves and connecting-pipes, either chamber can, according to requirements, be connected with, or disconnected from, the system; and when a certain quantity of mud has settled down in one chamber, the chamber can be disconnected from the system, while another charged with iron-salt solution is connected with it.

Acetylene Burners.—Windham, F., of Queen Victoria Street, E.C. No. 10,815; May 11, 1898.

This burner is made in two parts—a nozzle with a relatively small hole through which the gas escapes from the supply-pipe, and a cap with a relatively large hole through which the gas passes to be burnt—and one or more openings through which atmospheric air is allowed to enter the space between the cap and the nozzle. The nozzle has a flange or collar, against which the cap can be pressed home; and its end is reduced so as to form a chamber between it and the cap when the latter is applied. In this chamber, the air is heated before passing out with the gas through the larger hole. In fig. 1, the inner cap is so constructed that it fits gas-tight upon the pipe through which the acetylene is supplied, and is provided with a small orifice at the top and a flange or shoulder at the bottom. A second (outer) cap fits over the other one, so as to leave an air-space between their upper portions. This outer cap is provided with holes through which air is admitted.

Fig. 1.

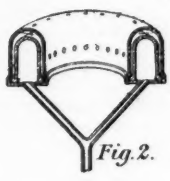


Fig. 2.

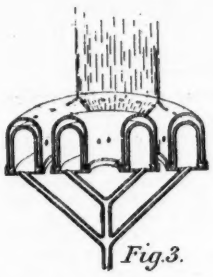


Fig. 3.

Fig. 4.

Fig. 2 shows a ring-burner. In this case the orifices are formed in an annulus in communication with the gas supply-pipe, and are made in an annular cap fitting over an inner annulus. The orifices are so arranged that the gas-jets are directed towards a common centre; and thus a cup-shaped flame is obtained.

When a flame of great brilliancy is desired, the burner illustrated in fig. 3 is advantageous. Here there are two concentric annuli and two annular caps; the orifices in one set being inclined at an angle of 90° to the corresponding orifices in the other set.

Fig. 4 illustrates a burner suitable for heating purposes. It is similar in construction to fig. 1, but is provided with an additional cap having an orifice and holes for the admission of air. In this burner, the orifice in the outer cap is preferably larger than the orifice in the inner one.

Ignition Apparatus for Gas-Burners.—Urquhart, R. J.; a communication from the Actiengesellschaft fur Fabrikation von Broncewaaren und Zinkguss, and S. J. von Romocki, of Berlin. No. 11,320; May 18, 1898.

This invention relates to apparatus for igniting gas-flames by means of an electric spark or a wire raised to incandescence, by a combination with the burner-cock of a segment or equivalent surface attached to the plug of the cock, and arranged in such a manner that, when the cock is opened, the surface makes a sliding contact, and closes the circuit of an electrical ignition apparatus arranged on the burner, so as to ignite the gas.

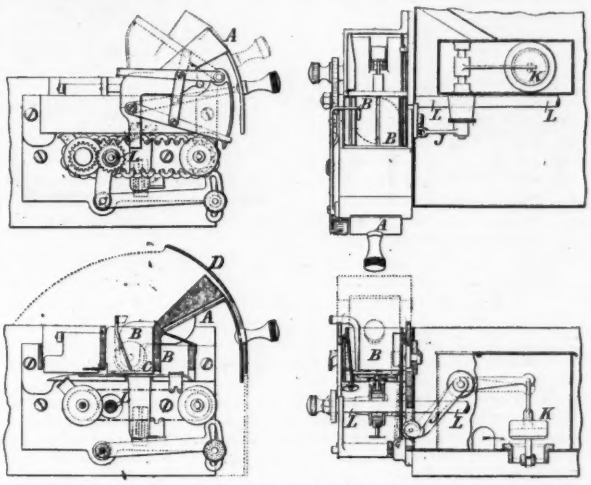
Coin Prepayment Mechanism for Meters.—Peebles, D. B., of Edinburgh. No. 13,599; June 18, 1898.

In meters made according to this invention for receiving (say) pennies, a weighted inclined shoot or duct is provided, into which the pennies are inserted, and which is made capable of being tilted upwards by being centered beyond its inner end on a box attached to the meter-case, and formed with outer and inner moveable sides. The arrangement is such that on the shoot being tilted, after the insertion of a penny, the outer moveable side of the box moves outwards, permitting the penny to fall into the box between the moveable sides; and on the shoot returning down, both sides of the box and the penny are moved inwards the inner side, acting on a lever, and thereby opening the inlet supply-valve.

The illustration shows a side elevation, a longitudinal vertical section, a plan, and a transverse vertical section of the coin-prepayment mechanism.

The inclined shoot or duct A, into which the penny is inserted, is centered beyond its inner end on pins fixed in a box B attached to the meter-case by screws. It is capable of being tilted so as to increase its downward inclination; so that, on being inserted, the penny C slides down to a barrier. The shoot is then tilted by the handle shown, which lifts it above the barrier, and causes it to slide down into the box. At the same time, the tilting moves the outer end of the shoot under a fixed covering part D; thereby preventing the introduction of a wire or other fraudulent instrument while the inner end of the shoot is not closed by the barrier. The under side of the shoot is made with an opening of somewhat smaller size than a penny; and if a smaller coin is inserted, it drops through into a receptacle provided for it, and has no effect in working the apparatus.

The box B is made deep enough to hold a pile of twelve pennies; and it is provided with moveable sides, each swinging to a small extent in bearings formed on the upper part of the box. When the shoot is tilted, a piece fixed to its side is shifted, and allows the outer side of the box to move outwards, so as to freely admit the penny coming from the shoot into the box; and on the shoot returning down by the action of a weighted part on it, its side-piece, acting on a cam projection formed by a roller on the outer moveable side, presses that side inwards. This action presses the penny towards the other moveable side of the box, and makes it move. This side, in moving inwards, acts on an anti-friction roller on a lever J, so as to turn the lever, and thereby open the inlet-valve K. The weights acting on this inlet-valve, and on the shoot, are adjusted so that, while the weight of the shoot, acting through the outer and inner moveable sides, can open the valve, the valve will close when the penny is absent.



When the inlet-valve is open, the gas operates the meter in the ordinary way, and acts on the counter by the usual gearing. From the counter gearing (not shown) a spindle L is driven, which, through pinions, turns a sprocket wheel fixed to a spindle mounted in bearings on the framing; the sprocket wheel gearing with an endless chain, distended between the sprocket wheel and a guide pulley. The outer end of the spindle is carried on the shorter arm of a bell-crank lever centered on a stud fixed to the framing. By this means the relative positions of the spindles can be altered, so that one or both of the pinions may be changed, and the speed of the chain thereby altered to suit different prices of gas. The upper part of the endless chain passes under the box B, across the bottom of which there is a slot; and projecting catches on the chain, moving through the slot, engage each with the penny in the box, or with the bottom one of a pile of pennies. Each catch carries a penny out of the box through an exit-slot, and drops it into a cash receptacle (not shown). As each penny passes out of the box, it moves in contact with a lateral cam-guide, which makes it press the moveable side of the box to a small extent, so as by removing the grip to set the next penny free to drop. When the chain by its catches takes the only (or last) penny out of the box, the inner moveable side, acting on the valve-lever J, by reason of the penny being moved along the outer part of the lateral cam-guide, becomes gradually released; and the inlet-valve K is thereby also closed gradually, so as to give warning to the user that the gas supply is being diminished.

Metallic Mantles for Gas-Burners.—Boult, A. J.; a communication from E. Verbeke, of Brussels. No. 19,770; Sept. 17, 1898.

The following are the metals used for manufacturing mantles according to this invention: Platinum, iridium, rhodium, and palladium. What the patentee claims as novel is "the composition of the wires or thin metallic threads used for weaving the mantles; each metal being assigned its especial part in the preparation of the alloys, according to the consistency and malleability to be given to the mantles."

The following are given as the compositions for mantles not to be submitted to a gas pressure exceeding 100 millimetres: (A) Platinum 88, iridium 10, rhodium 2 per cent. (B) Platinum 90, iridium 5, rhodium 2, palladium 3 per cent. The alloys A and B are treated separately; and from each a wire is drawn to the average diameter of one-twentieth of a millimetre. The mantle is then woven from these wires with a mesh corresponding to No. 60 of French weavers, or about 50 to 70 meshes to the inch. The wires or threads made of the alloy A form the warp threads of the mantle—that is, the threads beginning at the top and terminating at the bottom of the mantle. The wires B serve to weave the weft—that is, the threads going round the mantle.

As regards mantles for gas under pressure—whether compressed gas or gas with an artificial air current—only one alloy is employed; and the thickness of the wires is modified. The composition of this alloy is as follows: Platinum 85, iridium 12, rhodium 3 per cent. These metals are melted together, and wires drawn from the alloy thus formed to a thickness of about one-tenth of a millimetre; the same alloy being used for weaving the warp and the weft.

The mantles are placed directly on any form of bunsen burner, and are said to "give a perfect incandescence throughout the whole of their surface."

Inclined Retorts.—Ingham, W., of Harrogate, and the Leeds Fire-Clay Company, Limited. No. 3628; Feb. 18, 1899.

The patentees propose, in the construction of inclined retorts, to form the ends of the retort lengths with recessed or rebated ends, and to fit in the recess or space thus formed (about the junction of the adjoining lengths) a cover-piece or strap arranged to project beyond the outside surface of the retort, formed in suitable lengths, and having the inner side shaped to correspond to the bottom of the recess or rebate of the ends, shown in the engraving.

Fig. 1 (p. 1372) is a vertical section of a retort about a division or supporting wall; fig. 2 is a front elevation; and fig. 3 is a back elevation

corresponding to fig. 1. The dotted lines fig. 1 show a cross section on the plane of the junction of two adjoining retort lengths. Fig. 4 shows another section of the rebated strap.

A indicates one of the division or supporting walls. B is one end of one retort length. C is the end of the next adjoining retort length. D is the line of junction of the two retort lengths. E is the recessed or rebated end of the retort length C. F is the adjoining recessed or rebated end of the retort length B. The rebated strap fits in the space left by the recesses or rebates of the ends E and F. As shown by the division lines

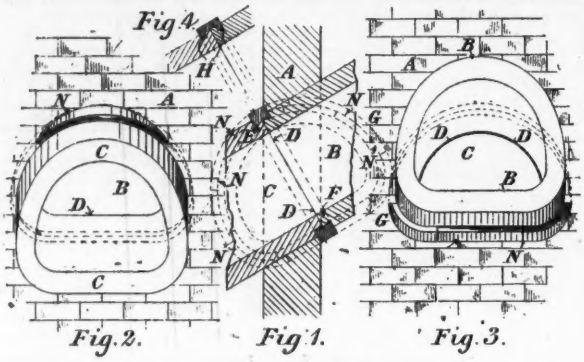


Fig.2. Fig 1. Fig.3.

N in the dotted cross section of fig. 1, this is formed in lengths with over and underlapping ends, and so that the top and bottom lengths (which are only very partially built in the division wall) are further secured in position by the adjoining lengths on each side. The rebated strap projects about half its depth beyond the outside surface of the retort; and this half is embedded in the division wall so that, while closing the joint D gas-tight, it also supports the retort against the tendency to slip downwards and forwards.

The inner side of the rebated strap is shown in fig. 1 with a double incline, so as to form a dovetail joint, and thus prevent any tendency of the lower length C to slide downwards away from the upper length B. This may be effected as shown in fig. 4, where the ends of the retorts are formed with circumferential grooves H, and the under side of the rebate or cover strip G is shaped to correspond.

APPLICATIONS FOR LETTERS PATENT.

9611.—Moss, R. J., "Production of acetylene gas." May 8.
9612.—Dent, C. H., "Carriers for incandescent gas-burners, to check vibration." May 8.
9690.—Denayrouze, L., "Incandescent lamps." May 8.
9743.—Deike, A. H., Alexander, A. W., and Mitchell, J., "Acetylene gas-generators." May 9.
9807.—Strutton, J. H., "Explosion engines." May 9.
9819.—Ridout, R. H., "Liquid meters and motors." May 10.
9883.—Wilton, G., "Manufacture of sulphate of ammonia and the extraction of cyanogen." May 10.
9890.—Hilger, E., "Regenerating gas-furnaces." May 10.
9905.—Hallengreen, H. A. J., "Prepayment gas-meters." May 10.
9909.—Boult, A. J., "Production of acetylene gas." A communication from A. Molet. May 10.
9982.—Driessche, L. V., "Apparatus for combustion." May 11.
10,001.—Bouchaud-Praceiq, E., "Carburators." May 11.
10,039.—Woodmansey, A., and Brins Oxygen Company, Ltd., "Apparatus for detecting gas leakage." May 12.
10,041.—Roberts, V., "Breaking or crushing coke, lime, and the like." May 12.
10,058.—Mahle, G., "Acetylene lamp." May 12.
10,083.—Daix, V., "Mantles for incandescent lighting." May 12.
10,096.—Parker, J. W. & G. J. C., "Gas and oil engines." May 13.
10,101.—Bruce, A., "Valve mechanism of engines for raising or forcing liquids, and for other purposes where compressed air or gas is required." May 13.
10,108.—Pointon, S., "An improvement in engines and boilers, converting exhaust steam into water gas." May 13.
10,143-4.—Mathieu, J. C. E., "Explosion engines." May 13.
10,151-2.—Steiner, L., "Generating acetylene gas." May 13.
10,160.—Maruti, G., "Generating acetylene gas." May 13.
10,165.—Mulconroy, J. J., Armstrong, E., and Gaw, J., "Self-lighting devices." May 13.

The Skipton Gas Question.—At a meeting of the Skipton District Council last Thursday, the Parliamentary Committee reported that the Gas Company had given notice that on Saturday they would, at an extraordinary general meeting, consider and vote upon a resolution to borrow £4750 under the Skipton Gas Act, 1863, by creating new shares for the amount, bearing dividend at the rate of 7½ per cent. per annum. This, it was contended, was a breach of the arrangement made before the House of Lords Committee, and might entail the Council giving an increased price for the undertaking. The Council decided to make an immediate protest against the Company's action.

Newbury Corporation Gas Supply.—From the accounts of the Newbury Corporation Gas Department, it is gathered that during the past year 3131 tons of coal were carbonized; and the gas manufactured amounted to 34,410,000 feet, of which 30,573,100 feet were sold, and 3,245,000 feet unaccounted for. The profit on the year was £1738; and after paying interest, &c., on the capital of £27,668, there was a net surplus of £364. It was decided to reduce the price of gas to 3s. 6d. per 1000 cubic feet for prompt payment; and graduated charges were fixed for consumers using slot meters, and those providing their own fittings. It was estimated that the reduction would mean a lessened revenue of £525; but it was expected to effect a saving of £650 in salaries and management and cost of coal. It is proposed to introduce slot meters and gas-stoves, and a large increase in the consumption is anticipated.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Gas Institution Papers.

Sir,—Referring to your editorial notice of the recent meeting of the Institution of Gas Engineers, and your criticism of the papers that were read, I venture to suggest, through your columns, that it would be a great improvement if the members who write papers descriptive of plant and apparatus would endeavour to avoid giving lengthy and minute details of dimensions, &c. These are things which have no value for discussional purposes, and, generally, no bearing on the importance of the subject.

In former years papers were subjected to revision at the hands of a very able gentleman; but, either because that gentleman's time is now too fully occupied, or for some other reason, nothing of the kind was done this year.

Personally I think revision is better avoided if it can be dispensed with; but I confess to having experienced, during the reading of some of the papers this year, a feeling that they very much needed it. Had the opportunity been afforded me prior to the printing of the papers, I should have been pleased to suggest some curtailment of their lengthiness.

If the writers of papers would consider more what is suitable and worthy to occupy the time of the assembly, and would recognize that details which in relationship to their own work have assumed importance, do not possess the same importance for the general body of members, they would escape these errors of judgment.

I do not think the subjects dealt with in the papers could be classed as wanting in importance. It was the manner in which they were handled that was defective.

Manchester, May 19, 1899. G. E. Stevenson.

Mr. Lacey's Remarks at the Meeting of the Institution of Gas Engineers.

Sir,—I regret that I made myself so imperfectly heard at the discussions on the papers by Mr. Lewis and Mr. Botley at the recent meeting of the Institution of Gas Engineers that your reporter was not able to quite grasp the sense of some of my remarks. Speaking upon Mr. Lewis's paper, I find I am made to say: "If the air were in excess, it always meant carbonic oxide in the furnace." The author stated that the use of steam in the generator tended to form blowpipe flames in settings with restricted combustion chambers; and I mentioned the fact that I had known the same effect produced by an excess of secondary air where steam was not used. In the discussion on Mr. Botley's paper, I advised caution in accepting figures based on the illuminating power of carburetted water gas, as there were no standard methods of testing 20-candle water gas.

Pimlico, May 18, 1899. T. S. Lacey.

Charging Expenditure for Repairing a Leaky Reservoir.

A correspondent asks if any of our readers can inform him as to the correct way of charging expenditure incurred in making a leaky reservoir water-tight—whether to capital or to revenue. He will also be glad to be referred to any legal or other decision on this point.

A Correction.—In the paragraph on the gas supply of Burslem, in the "Journal" last week, the name of Mr. J. Tindall was inadvertently given instead of that of Mr. Henry Peaty as manager of the gas-works.

Belfast Corporation Gas Accounts.—The annual accounts of the Belfast Corporation Gas Department show continued success. In the account of the manufacture and sale of gas, the amount received was £179,911; and the balance carried forward to the net revenue account was £48,252 16s. 8d.

Gas-Works Profits at Stafford.—At the meeting of the Stafford Town Council last Tuesday, the Gas Committee reported that the net profits for the year were £9545, which was equal to a dividend of 13 per cent. After making provision for interest, repayment of loan, depreciation, and reserve funds, there was a balance of £1750 to be handed over to the district fund in relief of the rates, which was an increase of £500 on the previous year.

The Rayleigh Gas-Works in the Market.—By an announcement which appears elsewhere, our readers will see that Mr. Alfred Richards has received instructions from Executors to offer for sale, at the Mart, Tokenhouse Yard, on the 30th inst., the freehold works of the Rayleigh Gas Company. They stand within about 350 yards of the Rayleigh Station on the Great Eastern Railway, and include a manager's house, office, and workshop. The whole will be sold, with the distributing plant, as a going concern; and possession will be given on the completion of the purchase.

Gas-Works Profits at Bingley.—At the meeting of the Bingley District Council yesterday week, the Chairman of the Gas Committee (Mr. Gatecliff) made a statement regarding the working of the undertaking during 1898. He said that the gas made had amounted to 85,928,009 cubic feet—a decrease of 928,000 feet, as compared with the previous year; but this apparent decrease had been more than compensated for by a great saving in leakage. The amount of leakage in 1898 was 2,542,700 cubic feet, equal to 2·96 per cent.; this being less than half the amount for the previous year—the gain having been largely the result of the renewal of old mains, and the increased consumption in the daylight hours. The sales had amounted to 83,385,300 cubic feet, and realized £10,421; while the receipts from coke and residuals had been £2597. The capital of the works now stood at £20,468; but the plant was put down at £42,983, though the selling value of the undertaking would be fully £100,000. He intimated further that the question of purchasing the Cullingworth Gas Company's works would be dealt with almost immediately. The net profit on the year was £852. The statement was adopted by the Council; and a vote of thanks accorded to Mr. Gatecliff.

PARLIAMENTARY INTELLIGENCE.

Gleanings from the Committee Rooms.

Promoters of Bills in Parliament will do well to mark the lesson to be drawn from the proceedings on the gas clauses of the Bradford Corporation Bill, to which reference was made in the "Gleanings" last week. It is that too much faith must not be placed on premature expressions by a Parliamentary Committee of satisfaction with *ex parte* evidence. In this case, one cannot refrain from admiring the Committee for having the courage of their opinions, and completely reversing on Monday last week, after having heard the opposing side, the strongly expressed view of the previous Friday on the question before them. But at the same time it must be said that, by their precipitancy in the first instance, they put both parties into a perfect quandary as to the course they should take. The position was this: Just before the Committee rose on the Friday, only part of the evidence which the promoters proposed to lay before them on the gas section of the Bill had been submitted; and the Chairman announced that the Committee were satisfied with it, but, if the opponents desired to present any evidence which they thought would modify or alter their view, they would be prepared to receive it. Feeling a sort of security in this declaration of satisfaction, the promoters did not deem it necessary at this stage to call further evidence on the re-assembling of the Committee on Monday; but the opponents—wisely as the result proved—determined to defend their rights, and prosecute their opposition to the preamble of the Bill. In doing this, they occupied nearly the whole of Monday's sitting; but they succeeded in altering the views of the Committee, and so will retain possession of their property intact. Upon this, and the dogged perseverance which gained them the day, we congratulate them.

As shown last week, the purpose of the clauses in question was the acquisition of the portions of the undertakings of the Pudsey and Shipley Gas Companies lying within the extended boundaries of the borough of Bradford. Now it must not be everlooked that these Companies were in occupation of their districts, and supplying the requirements of the inhabitants, long before the Corporation added to their territory the parts they have become desirous of serving with gas. Then, again, there is all the difference in the world between complete acquisition and dismemberment. It requires a deal of compensation to recompense a man for the loss of a limb which has assisted him in earning his daily bread; and to Companies like the Pudsey and Shipley, it would require a greater compensation in proportion to remunerate them for the loss of a valuable profit-earning part of their estate than they would fairly be entitled to if it was a question of taking over their concerns in their entirety. It is not merely a question of compensation for the income lost in the areas proposed to be acquired, together with the value of the pipes; but the producing plant and other works have been planned and provided for meeting the requirements of the district as a whole. Had a part of the districts been taken away, it might have been some time before the consumption in the remainder of the district would have risen to such a degree that the whole of these works would again have been profitably employed; and meanwhile the portion of the plant required for the supply of the areas in question would have been unproductive.

While feeling a little sympathy with the consumers within the borough boundaries supplied by the Companies, seeing that they have to pay a few pence per 1000 cubic feet more for their gas than their fellow ratepayers, the position so far as they are concerned is not now what it was. When the limits of the borough were extended, Parliament, respecting the rights of the Companies, deliberately gave them protection by special clauses in the Corporation Bill. Then the consumers for whom the Corporation are now showing so much solicitude, were in a far more unfavourable position than they are at present. The Pudsey Company, for instance, have narrowed down the difference between their price and that of Bradford to 3d.; and this gives promise that the difference will before long be eliminated altogether. Theirs, too, were not the only interests to be considered. Severance might have prevented the Company for years attaining the position at which a further reduction in price could have been made; so that, if Bradford had been successful with their proposal, about three-fourths of the Company's consumers would have been made to suffer in order to benefit—perhaps only for a short period—the one-fourth residing within the Corporation domain. This would have been manifestly unjust. Altogether, we are not sorry there was a veering round of the Committee's views, and that the integrity of the Companies' districts has been maintained.

The contest between the Corporations of Derby, Leicester, and Sheffield over the watershed of the Derwent was kept up before the House of Commons Committee presided over by Sir John Brunner till last Wednesday, when an announcement was made by Mr. Littler, representing the last-named Corporation, that progress had been made with the view to an amicable arrangement being come to between the contending parties. He stated that so many matters were close upon final settlement that he must be careful not to prejudice anybody's rights or interests. They had so far advanced that to go any farther at that stage might do absolute harm. Therefore, with the assent of the authorities of the other three towns concerned—Nottingham, Leicester, and Derby—he asked for an adjournment forthwith. The learned Counsel promised that all parties should have information as to any scheme or arrangement that might be agreed upon; and on this understanding the proceedings were adjourned till the 6th prox.

A recent decision of a Committee of the House of Commons affords an opportunity of referring to an experience of the London Hydraulic Power Company, from which others may profit. It shows the necessity of "understandings" with agents and officials of the London County Council being well-defined, and being fixed up in such a hard-and-fast manner that they cannot be subsequently rejected or ignored by the Council themselves. By the London County Council (Subways) Act of 1893, it was provided that, where a subway existed under any street, Gas and Water Companies having the power to break up the streets should use the subways for the purpose of laying their pipes. In determining the amount of rent to be paid for the use of the subways, consideration was to be given to the saving which would be effected by the Companies compared with laying the pipes in the road; while for other users of a subway, the same Act provided that the County Council should have power to enforce a scale of charges subject to the approval of the Board of Trade. When this Bill was before Parliament, the Hydraulic Power Company took part with the Water Companies in preparing a clause which was finally accepted by the County Council; and, consequently, they withdrew their opposition. To the dismay of the Company, when the Council subsequently made up their scale of charges, they declined to recognize the Company as a Water Company, and put them on a scale which worked out, on the average, to eight times as much as the Gas and Water Companies had to pay. The Company contested the question in the High Court; but the Court upheld the Council's reading of the clause in the Subways Act governing the matter. This was a palpable injustice, seeing that, when the 1893 Bill was before Parliament, the Company were given to clearly understand that there would be no question about them being regarded as a Water Company. Besides, the Company are empowered by their Special Acts to exercise the powers of the Water-Works Clauses Act, of 1847, for the purpose of laying mains under streets; and they have exercised these powers to a very large extent—about 110 miles of mains having been laid. When the Council introduced their Improvements Bill this session, the Company saw their opportunity. They petitioned that they might, in regard to the subways contemplated by the Bill, have their status as a Water Company recognized. Mr. Corbet Woodall gave evidence in support of the petition; and the Committee who have had the Bill under consideration have allowed their contention. In all probability they had heard of similar "understandings" to that arrived at with the Hydraulic Power Company in 1893 being disregarded; and they were not disposed to countenance such procedure.

HOUSE OF LORDS.

Tuesday, May 16.

METROPOLITAN WATER COMPANIES [GOVERNMENT] BILL.

The House went into Committee on this Bill.

On clause 1, dealing with the duties and powers of the Metropolitan Water Companies as to the mutual supply of water,

Viscount HAMPDEN moved an amendment to provide that the money required for the construction of works under the Bill should be raised by the Company actually carrying out the works. He said the Bill as it stood provided for the raising of capital by the Companies jointly; and this was thought to be undesirable.

The amendment was agreed to.

On clause 2 (issue of debenture stock),

Lord JAMES OF HEREFORD moved to insert the following words: "Provided that a Company shall not be required to carry to a sinking fund a percentage on the amount of money for the time being raised by the issue of debenture stock created under the powers of this Act." He said this amendment was rendered necessary by the subsequent amendment which he had on the paper to omit clause 3 (payments to sinking fund). When the Bill came before the House of Commons, the insertion of the sinking-fund clause was not insisted upon; but the Select Committee of the House of Lords to whom the Bill was referred had inserted the usual clause. The Government still adhered to the original position in this matter. The object of inserting the clause was that when the undertakings of the Companies came to be acquired, there would not be a large amount of capital to be paid for by the purchasers. But the capital to be raised by the Bill was not to be used to earn a profit; and therefore the Government thought the justice of the case required the omission of the sinking-fund clause.

Lord RIBBLESDALE, the Chairman of the Select Committee on the Bill, defended the clause, which he contended had been inserted on the ground of public policy and public interest. A similar clause had, he said, been inserted in every Water Bill since 1886; and it applied already to some nine millions of capital. He asked their Lordships not to create a precedent by leaving it out of the present Bill. He based the Committee's action on three main grounds: (1) That the London County Council and the Corporation of London were better judges of the just interests of the people of London, present and future, than Her Majesty's Government and the Water Companies; (2) that the capital to be raised under the Bill, inasmuch as it added to the dividend earning and paying capacity of the Companies and to the stability of their undertakings, should be treated as these issues of capital had invariably been treated since 1886; and (3) that no good economic or financial reasons could be shown for interrupting the practice of Parliament and the continuity of legislation by omitting the sinking-fund clause.

Viscount KNUTSFORD thought the Committee had taken up a false position in regarding the money to be raised under this Bill as dividend-earning. It was to be raised for the special purpose of saving the water consumers from the very painful and distressing evils which they suffered under last year. The House of Commons had practically decided three times against the insertion of the clause; and he hoped that their Lordships would have regard to this fact, and accept the amendment.

Lord TWEEDMOUTH contended that the capital was dividend-earning; and he pointed out that it was not to be applied to any particular works, but to those which received the sanction of the Local Government Board. That department, in framing the Bill, had violated the practice prevailing for the past thirteen years in regard to the sinking-fund clause, and had taken out of the hands of Parliament the power of saying what amount of capital should be issued, and to what works it should be applied.

After some remarks from Viscount HAMPDEN and Lord DAVEY,

Lord JAMES OF HEREFORD, replying to Lord Ribblesdale, pointed out that there was no similarity between former Bills of the Water Companies and a Bill promoted by the Government; and he said everybody was astonished at the Committee insisting on the insertion of a sinking-fund clause as the condition of finding the preamble proved.

Lord RUSSELL OF KILLOWEN said a vital point had been put when it was shown that in Water Bills for thirteen years the sinking-fund clause had been invariably introduced. The onus, therefore, lay upon his noble and learned friend (Lord James) to justify making the Bill an exception. He contended that the Bill would increase the earning powers of the Companies.

The Marquis of SALISBURY pointed out that the money to be raised was to be spent, not by the desire or at the request of the Water Companies, but by the obligation imposed upon them by the Government; and there was no reason to say it would add to their dividend-earning power. A Water Bill was one asking for power to raise capital to provide water. But this was not such a Bill, and therefore could not be touched by the thirteen years' precedent cited.

The Committee divided, and the numbers were: Contents, 51; not-contents, 20—majority for the amendment, 31.

Lord TWEEDMOUTH moved to add at the end of the proviso words declaring that the total amount of the stock issued should not exceed £500,000.

Lord JAMES OF HEREFORD pointed out that the whole question was left to the discretion of the Local Government Board, who would see that no undue sum was expended.

The amendment was withdrawn; and the clause, as amended, was added to the Bill.

Clause 3 was then struck out, and clauses 4 and 5 were agreed to.

Earl COWPER moved the insertion of the following new clause: "Nothing in this Act shall authorize the construction by any Metropolitan Water Company of any works for the purpose of utilizing any supplies of water drawn from wells outside the water limits of the Metropolitan Water Companies not now utilized under the powers possessed by such Companies."

Earl STANHOPE supported the clause.

Lord JAMES OF HEREFORD said the Government did not intend by the Bill to give the Companies any further powers of taking water, and would therefore accept the clause.

The clause was added to the Bill.

The remaining clauses were agreed to, and the Bill, as amended, was reported.

Thursday, May 18.

On the report of the amendments to the Bill being received,

Earl CARRINGTON moved to add at the end of clause 2, relating to the issue of debenture stock, an amendment providing that the stock raised by a Metropolitan Water Company under the Bill "shall not exceed £500,000."

Lord JAMES OF HEREFORD was understood to say that the Local Government Board had not seen their way to agree to the insertion of these words. He pointed out that the expenditure under the Bill could only take place in cases of great emergency.

Earl CARRINGTON said it was exactly this great expenditure which the ratepayers of London were so anxious to avoid.

The amendment was negatived, and the Bill read the third time and passed.

The following further progress was made with Bills down to the Whitsuntide recess: –

Bills brought from the Commons, read a first time, and referred to the Examiners: Belfast Water Bill, Birmingham Corporation Bill, Dublin Corporation Bill, East London Water Bill, Redditch Gas Bill, Shirebrook and District Gas Bill, West Middlesex Water Bill.

Bills read a second time: Gas Orders Confirmation Bills (Nos. 1 and 2), Goole Urban District Council Bill, Scunthorpe Urban District Gas and Water Bill, Water Orders Confirmation Bill.

Bills reported, with amendments: Brigg Urban District Gas Bill, Cobham Gas Bill, Lowestoft Water and Gas Bill, Stretford Gas Bill, Whitehaven Corporation Bill.

Bills read the third time and passed: Brigg Urban District Council Bill, Burley-in-Wharfedale Urban District Water Bill, Bury Corporation Water Bill, Church Stretton Water Bill, Loughborough Corporation Bill, Metropolitan Water Companies [Government] Bill, Nuneaton and Chilvers Coton Urban District Council Water Bill, St. Neots Water Bill, Salford Corporation Bill, Stretford Gas Bill, Wakefield Corporation Bill, Water Orders Confirmation Bill.

The Workington Corporation Water Bill has been referred to a Select Committee, consisting of Lord Herries (Chairman), the Marquis of Hertford, Viscount Powerscourt, Lord Farnham, and Lord Monck; to meet on Tuesday, June 6.

The Corporation of London have petitioned against The Gaslight and Coke Company Bill.

HOUSE OF COMMONS.

The following further progress was made with Bills down to the Whitsuntide recess:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Bury Corporation Water Bill, Church Stretton Water Bill, Dundee Gas, &c., Bill, Gainsborough Urban District Council (Gas) Bill, Great Yarmouth Water Bill, Leigh-on-Sea Urban District Council Bill, Loughborough Corporation Bill, Salford Corporation Bill, St. Neots Water Bill, Stretford Gas Bill, Wakefield Corporation Bill, Wishaw Water Bill.

Lords Bills read a second time and committed: Broughty Ferry Gas and Paving Order Bill, Bury Corporation Bill, Hastings and St. Leonards Gas Bill, Skipton Urban District Gas Bill, Southampton Corporation Water Bill.

Bills reported, with amendments: Bootle Corporation Bill, Dublin Corporation Bill, St. Albans Gas Bill [Lords], Woking Water and Gas Bill.

Bills read the third time and passed: Belfast Water Bill, Birmingham Corporation Bill, Coalville Urban District Gas Bill [Lords], Dublin Corporation Bill, East London Water Bill, Manchester Corporation (General Powers) Bill.

The Skipton Gas Company have petitioned against alterations in the Skipton Urban District Gas Bill [Lords], and the South Hants Water Company against the Southampton Corporation Water Bill [Lords].

The Lords' amendments to the Metropolitan Water Companies [Government] Bill were considered by the House on Friday, and agreed to.

The Chairman of Ways and Means (the Right Hon. J. Lowther) has reported from the Committee of the Cambridge University and Town Gas Bill that a report from the Local Government Board relative to the Bill had been considered. With reference to clause 39 (formerly clause 38) giving the Company power to inspect gas-fittings in new buildings, provision had been made in the Bill during its passage through the House of Lords for appealing to the Mayor of Cambridge against any order made under the clause; and in its amended form the Committee were of opinion that the clause might be allowed. All the other recommendations contained in the report had been met by amendments made in the Bill in the Upper House. A report from the Home Secretary relative to this clause had also been considered; but, after hearing evidence, the Committee decided that the clause as now framed afforded sufficient protection to the public.

Sir William Walrond has given notice to move for the appointment of a Joint Committee of the Lords and Commons to consider and report as to "the principles which should govern powers given by Bills and Provisional Orders to municipal and other local authorities for industrial enterprise within or beyond the area of their jurisdiction."

HOUSE OF COMMONS SELECT COMMITTEE.

Tuesday, May 16.

(*Sir* JAMES RANKIN, *Chairman.*)

THE POWERS OF CHARGE OF THE METROPOLITAN GAS COMPANIES.

On the Select Committee resuming their sitting to-day, further evidence was given by

Mr. H. E. JONES, M.Inst.C.E.

Examined by Mr. COHEN, witness said his district was at a great disadvantage on account of the poverty of the inhabitants reducing the consumption, and also because the Company were unable to transport coal as easily as the South Metropolitan or The Gaslight and Coke Company. Owing to the Company having readily accepted the sliding-scale, they obtained power in 1875 to issue certain capital to their shareholders at par, instead of under the auction clauses. He agreed that this formed an additional burden on the Company.

Mr. COHEN: Therefore your consumers have been prejudiced to some extent by the arrangement which frees you from the auction clauses?

Witness: Yes.

And at how much do you estimate this?—1¼d. per 1000 cubic feet.

From a consumer's point of view, therefore, you admit that issuing stock at par which would have fetched I do not know how much—perhaps £200 or £175—has prejudiced your consumers to the extent of 1d. per 1000 cubic feet?—*Pro tanto* it has.

In further examination, witness stated that they had expected this capital to be exhausted in twelve years—never thinking that the stagnation in gas consumption would be so great that capital usually expended in twelve years would last all this time. Practically, the method of raising capital by allotting stock was now obsolete; there was hardly a company in the country who now possessed this old privilege. It affected the price of gas; and his Directors had been considering the question, as they had a little more capital yet to allot. They thought, however, they could not escape the obligation to the shareholders which they had come under according to their Act of Parliament. The Act gave the shareholders certain rights; and the Directors were not at liberty to deal with these rights as they thought fit, as any shareholder refusing to be a party to a fresh settlement might apply for an injunction to arrest the Board from dealing with the property in any but the way authorized by the Act.

The CHAIRMAN: Can you explain how your Company can supply gas at a less price than The Gaslight and Coke Company, whose district is not so badly situated as your own? Are there any circumstances which would account for the difference in your opinion—6d. per 1000 cubic feet is a good deal?

Witness: I may say if you could relieve me from questions in that direction I should be very much obliged. I am fully willing to explain, to the best of my ability, the differences between my own Company and the South Metropolitan Company.

The CHAIRMAN said he would not press the point.

Further examined by Mr. COHEN: The extra 10d. per 1000 cubic feet charged for gas through the prepayment meters covered interest on capital, renewal and repair of fittings, cost of collection, &c. The cost of collection in the case of ordinary consumers was a nominal sum; but with prepayment meters it amounted to nearly 5 per cent. The Company had been encouraging the use of silver meters—shilling prepayment meters—as some people showed a desire to pay for the gas as they used it; but the number in use was very small. Each prepayment meter was usually emptied once a month. If their capital which was authorized in 1875 had been made subject to the auction clauses, the Company would have been able to sell gas 1¼d. per 1000 cubic feet cheaper than they were now charging. The rebates in the price of gas during the past 21 years showed that, out of savings by means of economy and improvements, which they had been able to introduce, five-sixths went to the consumer and one-sixth to the Company. Nothing but the sliding scale would have brought the price down as it had been. It had been a great spur in the case of the Commercial Company. At the time of the coal famine, the Company drew on their reserves and accumulated funds rather than increase the price of gas. The prosperity of the Company had always been best served by reducing the price. The Company were now having a steamer constructed with a view to seeing if it could pass up the Lea to their works; and if the experiment was successful, more steamers of a similar character would be built. A reduction of 2d. per 1000 cubic feet would accrue at the works where these steamers went. The first steamer would be completed in about nine months.

Mr. COHEN: When do you think this reduction of the price will take place, which will accrue when you are properly equipped?

Witness: I think, roughly, in about eighteen months.

By Mr. STEADMAN: In 1889, there were various labour troubles, following which the Company reduced the hours of labour of the men to

eight, increasing the shifts by 50 per cent. The Company hoped the men would work harder during the shorter hours; but the change cost the Company 50 per cent. more in wages in respect of carbonizing—raising the cost of carbonizing from 3d. to 4½d. A further restriction was placed on the Company as to working on Sunday; they were made to pay double for both the early shifts on that day. Machines were now used; but though they saved something, they did not save all this extra expense. They also caused damage to the residuals; coke produced by machinery being inferior to that produced by hand. The labour saved by the machinery they had introduced had nothing like compensated them for the extra amount they had to pay in wages in introducing the eight-hour shifts. The wages of the South Metropolitan Company for carbonizing were 2·78d.; the figure of the Commercial Company being 4·25d. The difference was certainly not attributable to machinery, but to the profit-sharing system and the more energetic and hearty way the men worked under the South Metropolitan Company. The Commercial Company did not have the profit-sharing system. The profit-sharing meant about 0·5d., which, added to the 2·78d., would give 3·28d. as the total amount paid by the South Metropolitan Company, against the 4·25d. paid by the Commercial Company. Not much difficulty was experienced in disposing of their coke, because the Company's area was of a working-class character, and working men used coke largely. The chief trouble in connection with coke lay in the fact that they had at their doors two gas-works supplying other districts, which works produced and sold a great deal of coke. All the coal used was brought to their two works away from the river in barges; and this was expensive.

By Mr. Nicol: The number of coin meter consumers had increased from 300 in 1893 to 9551 in 1898; but it did not raise the sale of gas very materially.

Mr. Nicol: Though the coin meters increased, the consumption by them is not as profitable as gas supplied in the ordinary way?

Witness: Nothing like it; and it locks up a great deal of money.

By Mr. Lowles: The Company had unallotted at present £45,320 of ordinary share capital and £64,892 of debenture capital.

Mr. Lowles: Are you on working terms with The Gaslight and Coke Company?

Witness: Oh, yes.

Do you overlap at all?—No, we are entirely restricted.

They have distinct advantages over you?—I think their district of supply much better.

I am talking of the advantages of production?—As regards coals, they have some large works on the Thames; but they have some up a canal.

They have a much larger output?—Yes.

How do you account for their charging 6d. per 1000 cubic feet more than you?—I would much rather not answer that question. What I am fully prepared for is to be tested as to why we do not supply so cheaply as the South Metropolitan Company.

I rather took it the other way—why The Gaslight and Coke Company do not supply so cheaply as you. You have shown us clearly you have not the same advantages as the South Metropolitan Company. Following the same line, I gather The Gaslight and Coke Company have advantages over you. Have you some understanding by which you fix the price charged to the penny-in-the-slot consumers in relation to the ordinary price charged?—Yes; we charge 10d. per 1000 cubic feet extra, to pay the cost of collection and other extra expenses which the method entails.

Sir A. Scoble: I think you told the Committee that the average return on the capital of the Company is 11·4 per cent?

Witness: That is correct.

Sir Courtenay Boyle told us that the effect of the auction clauses has been that the average rate of interest payable on share capital issued by The Gaslight and Coke Company and the South Metropolitan Company has been less than 5 per cent.?—I suppose by that he means the new capital issued since 1875 under the auction clauses.

So that it is a very great disadvantage to the public, is it not, that the auction clauses have not been adopted in your case?—It would have been but for the great economy with which we spend our capital, and the way in which we keep it down.

I think you have calculated how the output of gas from your three stations works out as compared with that of the other two Companies. Will you give us those figures?—The Commercial Company have three works for a total annual sale of 2341 million cubic feet, or 780 millions per works; the South Metropolitan Company have six works for a total output of 8844 millions, or 1440 millions per works (or nearly double the scale of the Commercial Company); while The Gaslight and Coke Company have ten works for a total output of 21,022 millions, or 2102 millions per works (or nearly three times the scale of the Commercial Company). Everyone who knows anything about works will see that certain of the expenses of the Commercial Company are much in excess of those of the other two Companies. There is no probability of our works being concentrated in a more favourable position on the riverside, because the banks of the Thames in the district are already fully occupied.

You do not have much competition from electricity?—Not yet, but a great many firms use electricity manufactured by the use of our gas, which we supply at a cheaper rate for the purpose.

Mr. Nicol: What do you think will be the saving in the cost of carriage of your materials when you get the new steamers?

Witness: 1s. 6d. per ton of coal. This will be equivalent to not quite 2d. per 1000 cubic feet of gas on the cost of production for all the works can make.

Mr. A. C. Morton *was next called.*

He said he was a member of the Streets Committee of the Court of Common Council of the City of London, and had been deputed by the Committee to express the views of the Corporation upon the question of the charges made for gas by The Gaslight and Coke Company. Between 1860 and 1880, the City Corporation expended over £29,000 in the interests of the gas consumers, and for their protection, in opposing or supporting Bills; and this year they had spent so far about £500.

The Chairman: Do the City agree in the main with the legislation passed in 1876 with regard to the sliding-scale, fixing the standard price and standard dividend?

Witness: We hoped, of course, that it would be satisfactory to the gas consumers; but, unfortunately, as far as we can judge by The Gaslight and Coke Company, it does not appear to be so.

Do you think the prices are not so low as they would have been if the law had not fixed a standard scale?—What I mean is that if we had competition instead of the present arrangements, we should probably have lower prices.

How would you have competition?—If we had more Companies.

Do I understand you to mean you would not have allowed the amalgamation of so many Companies to have taken place?—Certainly not, unless we had hoped that the result would have been satisfactory. We were told distinctly all over London that the amalgamation of these Companies would necessarily save a lot of money in the expense of management, and consequently that the gas consumer would be thereby benefited. This was shown by the proceedings before Mr. Cardwell's Committee, and by the clause which the City secured the insertion of in the Act of 1868.

Since the sliding-scale was set up, have the prices of the various Companies been lowered or raised?—Well, I am told The Gaslight and Coke Company gradually reduced theirs from 3s. 9d. per 1000 cubic feet in 1876 to 2s. 6d. in 1889, since when it has been increased to the present price of 3s.

Then upon the whole it has been reduced 9d. per 1000 cubic feet?—Yes.

But this, I understand, is not as much as the City expected?—It appears to us that The Gaslight and Coke Company, of all the three or four Companies affected, has the most advantageous position in every way. At any rate, comparing them with the other Companies, they are charging an excessive price in our view.

That is one Company?—The Gaslight and Coke. We know the South Metropolitan Company are only charging 2s. 2d. per 1000 cubic feet, the Wandsworth and Putney Company (a much smaller concern) 2s., and the Commercial Company 2s. 6d.

Your expectations were not fulfilled with regard to the effect legislation in reference to the sliding-scale would have on the price of gas?—Yes, because we have before us the fact that the smaller Companies are only charging 2s. and 2s. 2d. per 1000 cubic feet under less favourable circumstances than the big Company.

Had you this fact before you when you formed the expectations?—We could not tell what was going to happen.

The price was then 3s. 0d. per 1000 cubic feet. What did you expect from setting up the sliding-scale?—I have no evidence of any expectation of ours. I do not profess to be a gas expert; but if I obtain in the south at 2s. 2d. per 1000 cubic feet the same sort of gas as is supplied in the north, I ought to get it in the north at 2s. 2d. In the City the cost of gas for public street lighting is 2s. 2d.; and it seems to us that if the Authorities can get it at this figure small shopkeepers ought to have it at the same price.

Can you give us any reason why The Gaslight and Coke Company should be able to supply gas at a cheaper price than they do?—I am not an expert; and therefore I do not pretend to give a reason why they do not do it. In the district of the Company south of the river, they are supplying gas at 2s. 2d., because they are compelled by Act of Parliament to supply at the same price as the South Metropolitan Company.

Have the City any suggestions to make as to future legislation in this matter?—We get the street lighting in the City of London at 2s. 2d. per 1000 cubic feet.

Mr. Cohen: Do you not light the City by electricity?

Witness: Yes; but that is worse still. We have got into a greater muddle there than with the gas.

Mr. Banbury: Why worse?

Witness: Why, the expense.

Mr. Cohen: I understand you do not use gas in the City at all?

Witness: Oh, yes, we do. We are only lighting the main streets by electricity.

In further examination by the Chairman, witness said it seemed very curious they should get gas for the street-lamps at 2s. 2d. per 1000 cubic feet, while the Company charged 3s. for gas burnt in similar lamps in underground conveniences. All the lamps were in the streets.

The Chairman: What is the remedy you propose?

Witness: The only thing I can suggest is that Parliament should put us on the same terms with regard to price on the north side of London as that little bit of district in the south of London supplied by The Gaslight and Coke Company.

Mr. Lowles: How are they to do it?

Witness: By a similar clause, I suppose, to that with regard to street lighting. If an Act were passed whereby The Gaslight and Coke Company were not to charge more than the South Metropolitan Company, then you have done it.

Mr. Banbury: Suppose the South Metropolitan Company's price went up to 3s.?

Witness: Then we could not complain.

The Chairman: However, you would have a law passed to make every one of the Gas Companies, in fact, only charge the price of the lowest?

Witness: We consider that as they all have to bring their coal and make their gas in the same district, practically, there can be no reason why the big Companies should not make it as cheaply as the others. The argument when they amalgamated was that the bigger the Company the cheaper would be the supply.

You say you cannot give any evidence as to mismanagement?—I am not a gas expert, and cannot give any evidence as to whether the management is bad or not. Another remedy I suggest is that the Company should not be allowed to obtain any further favours from Parliament until they have reduced their price.

In further examination, witness said the Corporation opposed the Company's Bill in the House of Commons last year, with a view to getting the price reduced; but the answer of Mr. Pope, the Counsel for the Company, was that the time to raise this question was when the Company were asking for additional capital. By the Bill of the present session the Company sought to raise further capital, and the Corporation thought the time had arrived for opposing the Bill, in order to secure its rejection unless the price was reduced to that of the South Metropolitan Company. The County Council took a preliminary objection to the Bill proceeding pending the report of this Committee on the question; but the Committee decided to proceed with the measure, so that at present the Corporation had no remedy in that direction. They therefore asked the present Committee to come to the assistance of the citizens of London, who were anxious to

assist the other portion of London to get gas at what appeared to be a fair price.

In reply to Mr. LOWLES, who asked whether the Corporation proposed to appear before the Lords Committee in opposition to The Gaslight and Coke Company's present Bill, witness said there was a meeting of his Committee that afternoon at which the matter would be discussed. They had power given from the Corporation to oppose the Bill; and very likely they would do so. Complaints as to the price of gas were received chiefly through representatives on the Council; and such was the feeling on the Council, that all the propositions of the Committee on this subject had been adopted unanimously.

Mr. LOWLES: Is there much gas used for power in the City?

Witness: We believe there is; but we have not the exact quantity.

You cannot tell us, can you, whether there has been any complaint made by those who use the gas of their being prejudiced by the difference in price on the north and south sides?—Oh, yes. My constituents have told me it is against their business interests to have to pay 40 or 50 per cent. more for their gas than if they were on the south side of the river. I think if there is no other remedy, you ought to allow the South Metropolitan Company to come in and supply us at 2s. 2d.

Have you considered any method by which you could obtain the result you have suggested—the price of gas being regulated by the lowest price charged?—What I venture to submit is that the only possible way of bringing it about would be to throw out the Bill you have just passed in the House of Commons, and let the Company come to you for terms.

That hardly answers the point. You were saying rather Parliament ought to fix the Companies to charge the lowest price?—I am afraid Parliament would only be likely to do it when the Company came to ask for favours, as they do this year.

Would that not lead to a ring being made among the Companies—the lowest raising their prices?—You would fix them by the sliding-scale.

Oh, yes, I am quite wrong there. Do you think the sliding-scale fixed by Parliament has had the effect of cheapening gas?—I really cannot say, because I am not a gas expert. The sliding-scale knocks the price down.

Mr. NICOL: The Gaslight and Coke Company are working on the sliding-scale?

Witness: Just so; but there is evidently something wrong somewhere.

Mr. BANBURY: I understand you have said several times you are not a gas expert. Your point is that on the south of the Thames they are charging 2s. 2d. with a discount; and that on the north side they are charging 3s. You think you ought to have the same price on one side as on the other?

Witness: Just so.

Not being a gas expert, you have not gone into the reasons for the difference; and it does not seem to enter your mind?—I put it as the same as buying bread.

Has it not entered your head that there might be reasons for the manufacture being more expensive on the north than on the south side?—Yes. I have thought over that; but I have been told that it is owing to mismanagement.

You would not contend that The Gaslight and Coke Company should supply their gas at a loss, because the South Metropolitan Company, under different circumstances, are able to supply at a lower rate at a profit?—I should. In regard to rateable value, population, income from all sources, and consumers per mile of main, the advantage is all in favour of The Gaslight and Coke Company. Regarding Mr. Hunt's statement that the Company are supplying at a loss south of the Thames, that only proves my assertion—viz., that if they are supplying at a loss, there must be some error in the management.

There is the Act of Parliament?—The South Metropolitan Company make and sell gas at 2s. 2d. per 1000 cubic feet. In the adjoining district, it ought to be made as cheaply as by the South Metropolitan Company, unless there is some mismanagement in the conduct of the business, or anything else you like, whereby they waste their money. I do not see how the coal could be any dearer to The Gaslight and Coke Company than to the South Metropolitan Company. There is no evidence that I know of to show that the electric light has affected one side of the river more than the other.

By Mr. NICOL: Parliament bound The Gaslight and Coke Company down to supplying gas south of the river at 2s. 2d., as a term of the amalgamation with (he thought) the London Company, not so many years ago; otherwise he presumed there would have been opposition from the south side of the river to the amalgamation.

Mr. NICOL: You are in favour of free competition, as against the monopoly which was given by Parliament to this Company working under the sliding-scale?

Witness: Unless you get regulations whereby we should be protected from this extraordinary difference of price between the south and the north of the river.

Assuming you do not, you would endeavour to have free competition?—Well, you see, competition is the only remedy.

You would be in favour of allowing the South Metropolitan Company to come into the City area, because they supply gas at 2s. 2d. per 1000 cubic feet?—If they will come to supply us at 2s. 2d., you ought to let them.

There would be no reference to the City Council as to taking up streets?—That is not a thing I am in a position to express an opinion on, because there are so many pipes in the City streets; but I believe there is still plenty of room in the middle of the road. We are gradually getting sub ways in the City; and then we can take as many pipes as are wanted.

May we take it that you are not dissatisfied with the price charged by the South Metropolitan Company?—Apparently it is exceedingly fair.

Supposing the South Metropolitan Company should be able to supply at 2s. per 1000 cubic feet without affecting the interests of their shareholders, and you had bound The Gaslight and Coke Company to sell at 2s. 2d., you would again come to Parliament and say that The Gaslight and Coke Company should supply at 2s.?—My answer is that The Gaslight and Coke Company ought to supply at the same price as the South Metropolitan Company. The price ought to go down automatically.

You can give no reason why The Gaslight and Coke Company charge 2s. 10d. per 1000 cubic feet, as against the 2s. 2d., except the general answer that you think it must be owing to mismanagement?—Yes. Beyond that there is the common-sense opinion that if you can make gas on the south side for a small area and a less advantageous district at 2s. 2d., you ought to be able to supply it on the north side at less.

Mr. NICOL said the Committee would be very pleased to have some expert evidence as to the cause of the difference in the charges of The Gaslight and Coke Company and the other Companies.

Witness said he did not know how it was to be obtained.

By Mr. COHEN: He had no doubt it was the hope of the Corporation at the time these amalgamations were effected that they would pay the consumers; but seeing that the price had this year been raised to 3s. per 1000 cubic feet, they were not satisfied.

Mr. COHEN: Do you attribute the rise in part to the amalgamation?

Witness: Well, I cannot say that; but I can honestly say amalgamation has destroyed competition, and therefore we can get no relief.

Is it the opinion of the Corporation that the rise has been brought about in part by the amalgamation?—Well, only so far as it is a monopoly—that we cannot create a means of competition.

Do you think if the Companies had not been amalgamated gas would have been able to be sold cheaper?—Apparently, from what you can judge by the other Companies. As to the sliding-scale, I have always thought it is of great use.

Therefore do you want to modify your answer to the Chairman? I gathered you were not satisfied with the results of the sliding-scale, though when brought into operation originally you had good expectations from it?—I only meant that under it The Gaslight and Coke Company charge 3s. for what we get for 2s. 2d. elsewhere. In answer to further questions, witness said he was not aware whether the County Council intended to oppose The Gaslight and Coke Company's Bill before the House of Lords. The Corporation some time ago wrote to The Gaslight and Coke Company asking an explanation of why their charge was so much above the price in South London. He had not the explanation—if one was sent—with him; but, if one was given, he undertook to supply it to the Committee. The Corporation's decided opinion was that they would rather that the Bill of The Gaslight and Coke Company were thrown out than that this (the present) Committee of Inquiry should sit. The Gaslight and Coke Company were the only people who could give the actual facts accounting for the difference in their price; but he did not suppose they would supply them.

Mr. COHEN: It is a phenomenon, apparently, that a loss should be made by one Company supplying gas at 2s. 2d. per 1000 cubic feet and a profit by another supplying it at the same price.

Witness: We do not think there can be any explanation except mismanagement.

By Mr. NICOL: The only conclusion arrived at in discussing the matter in his Committee was that the lower price of the South Metropolitan Company was due to better management.

Mr. DOUGHTY *was the next witness.*

He said he appeared on behalf of the Vestry of the Parish of St. Leonard, Shoreditch. Gas in the parish was obtained entirely from The Gaslight and Coke Company. The charge for public lamps was 2s. 2d. per 1000 cubic feet, and for Vestry public buildings 3s. This extra charge of 10d. had always been considered unjust. They thought that public buildings should be supplied at the same rate as public lamps. They had made application several times to the Company; but the reply had always been that the rate charged for public buildings was the same as for private consumers and for theatres. The Vestry thought there should be a universal price—the lowest rate. If the South Metropolitan Company supplied at 2s. 2d. per 1000 cubic feet for private consumers as well as for public lamps, they thought The Gaslight and Coke Company should do the same north of the Thames. Then, again, the amount charged to poor consumers by the penny-in-the-slot system was considered excessive. Many complaints had been made to the representatives of the Vestry of the high prices. The difference between the prepayment amount of 1d. for 22 cubic feet and the rate charged for public lighting was very great; it was nearly 76 per cent. more. The price for penny-in-the-slot meters worked out to over 3s. 9d. per 1000 cubic feet, against 2s. 2d. for public lighting. The Vestry also thought that the minimum rate should be charged all round for both public and private lighting. The Vestry also thought the Company should adopt the best available labour-saving machinery, so as to produce gas at the same price as the South Metropolitan Company.

The CHAIRMAN: It is the opinion of the Vestry that it is labour-saving machinery that is the cause of the lower prices of the South Metropolitan Company?

Witness: Yes; they use labour-saving machinery for stoking and charging the retorts. The Gaslight and Coke Company have not employed it to the same extent.

Have you any suggestion to make as to why The Gaslight and Coke Company have not done so, seeing that if they can reduce their price they can raise the dividend?—I am unable to give any reason for that.

You merely wish us to compare the fact that the South Metropolitan Company have done it?—Yes. The Vestry are also of opinion that the South Metropolitan Company should be able to supply gas to consumers north of the Thames, and give them the benefit of the lower price. There are many consumers in the district who use gas-engines, and who having premises in South London pay only 2s. 2d. per 1000 cubic feet; whereas in Shoreditch they have to pay 3s.

You said you thought the South Metropolitan Company should be allowed to supply gas to consumers north of the Thames. Do you mean throughout the whole area of The Gaslight and Coke Company?—Yes; they should be allowed to compete with them.

How would you suggest that this should be done?—By the putting down of mains by the South Metropolitan Company throughout the Gaslight and Coke Company's area?—Yes. They would have to get the permission first, no doubt.

And give to each householder the choice of which main he would draw his gas from?—Yes.

Do you think this would be an economical method?—The South Metropolitan Company have the secret of supplying gas at 2s. 2d. per 1000 cubic feet; and the consumers would naturally go to the cheapest producer.

Do you think, if a Bill were introduced and passed to this effect, that the result would be that The Gaslight and Coke Company would immediately reduce their terms?—I think so.

Would you recommend that this line of action should be taken to bring about such a result?—Yes.

Do you agree with the arrangements that now exist with regard to the sliding-scale?—Yes; they seem to have worked satisfactorily in the past. The price of The Gaslight and Coke Company has gone down, though not at the same rate as with the South Metropolitan Company.

Did the Vestry of St. Leonard, Shoreditch, form any expectations of the Bill (passed in 1876, I think) as to the effect upon price?—Yes; that as an effect of the amalgamation (producing gas on a larger scale) they would be able to supply it at a lower rate than was then charged. This has been realized to a certain extent, but not to the same extent as with the South Metropolitan Company.

Can you give us any reasons why, in your opinion, The Gaslight and Coke Company ought to charge a lower price?—I can give no further reasons than that if the South Metropolitan Company are able to do so The Gaslight and Coke Company should be able to. They can buy coals at the same rate, and pay no more for labour. The only idea is that if they had labour-saving machinery they might be able to produce gas at the same price as the South Metropolitan Company.

Your chief point is that they have not introduced labour-saving machinery, as you think they ought to have done, and so economized the working?—Yes.

By Mr. COHEN: Notwithstanding all the extra expense in connection with the prepayment meters, he thought the difference between the price of gas used in this way and of that used for public lamps was too large. There should only be a difference of 10 or 12 per cent., to cover the cost of the fittings, &c.

Mr. COHEN: You know that the district north of the Thames is quite as favourable as the south?

Witness: More favourable.

And therefore, as far as you are concerned, the price in the north ought to be at least as low as it is in the south?—Quite so.

And the fact that it is not, in your judgment calls for an explanation, which must be afforded by the Company supplying at the higher price?—Yes.

By Mr. STEADMAN: He believed the use of labour-saving machinery would reduce the cost; but he could not say to what extent the South Metropolitan Company employed such machinery. Some manual labour might be displaced by its use; but this would be made up by the increased gas consumption.

Mr. STEADMAN: What means have you of knowing that the introduction of the automatic stoker is going to mean a great consumption of gas?

Witness: By its making it possible to reduce the price of gas. If the price is lower, there will be more consumers. The higher the rateable value of a district, the better off the people are as a rule, with the result that they are able to use gas. The district of the Vestry, though thickly populated, is poor.

That being so, would the inhabitants be in a position to have gas, even if reduced to the minimum price of the South Metropolitan Company, instead of using paraffin oil?—A very great many would.

Would you be prepared to advocate that, in order to get a reduction in the price of gas, labour should be displaced?—Not to throw a number of persons out of employ. But I do not consider labour-saving machinery does away with much labour.

The CHAIRMAN interposed at this point with a suggestion that these questions were hardly pertinent; and they were not pursued.

By Mr. NICOL: He could make no suggestion, except as to the labour-saving apparatus, to account for the high price of The Gaslight and Coke Company.

Mr. LOWLES: Has the effect of the high price of gas been to expedite the adoption of the Electric Lighting Acts in Shoreditch?

Witness: Yes.

And has that largely displaced the use of gas?—Yes. The main roads are already lighted by electricity; and the Vestry have about 500 private consumers. The charge for the electric current is 2d. per unit.

In your opinion, the largest margin for improvement in the direction of lower prices would be in the saving of labour and cost of production?—Yes.

You do not know of any circumstances in the case of The Gaslight and Coke Company which would make their cost of production higher?—No.

The Committee then adjourned till June 2.

HOUSE OF COMMONS COMMITTEE.

Wednesday, May 10.

(*Before Sir* HENRY FLETCHER, *Chairman*, *Sir* LEONARD LYELL, *Mr.* R. F. CAVENDISH, *and Mr.* RICKETT.)

BELFAST CORPORATION BILL.

In the editorial columns of last week's issue, some comments appeared on the gas clauses of the Belfast Corporation Bill; and to-day we give a report of the proceedings thereon before the above Committee.

Mr. POPE, Q.C., the Honourable J. D. FITZGERALD, Q.C., Mr. M'INERNEY, Q.C., and Mr. T. HARRISON appeared for the promoters; Mr. PEMBROKE STEPHENS, Q.C., Mr. BALFOUR BROWNE, Q.C., Mr. JOHN GORDON, Q.C., Mr. VESEY KNOX, and Mr. H. NEWSON for the Belfast Harbour Commissioners; and Sir ALEXANDER MILLER, Q.C., for the Belfast and Northern Counties Railway Company and the Great Northern (Ireland) Railway Company.

In opening the case for the Corporation on this section, Mr. Fitzgerald stated that it originally contained three clauses—Nos. 22, 23, and 24. The first one, which was to empower the Corporation to use the lands now employed by them as an abattoir and storeyard for the purposes of their gas undertaking, had been withdrawn. The two remaining clauses related to entirely different matters; and it would therefore be more convenient to take them separately. Clause 23 was as follows:—

So much of section 43 of the Belfast Gas Act, 1852, as regulates or defines the discount to be allowed in respect of charges for gas, and section 58 of the Belfast Corporation Gas Act, 1874, and section 152 of the Belfast Improvement Act, 1878, shall be and the same are hereby repealed. It shall be lawful for the Corporation as from the passing of this Act to allow to any consumer of gas a discount upon each quarterly payment made by him in respect of gas not exceeding 5 per cent. of the amount of each such payment; but such discount shall not be allowed in any case where payment shall not have been made within twenty-one days after the account of the amount due from such consumer to the Corporation in respect of gas shall have been furnished to him.

Stating the reasons why this clause was introduced into the Bill, he admitted that prior to 1874 the Belfast Gas Lighting Company existed; and this Company, in an Act obtained in 1852, had a clause inserted to the effect that it should not be lawful for them to charge a higher price for gas than they were then charging, and also that they were to allow no less discount than they were doing at the date of the passing of the Act. The price they were charging was 5s. per 1000 cubic feet, with quarterly discounts varying from 2½ per cent. to 20 per cent. according to the consumption—that was to say, large consumers obtained 20 per cent. discount off their quarterly bills, and therefore only paid 4s. per 1000 cubic feet. In 1874 the Corporation acquired the works. The price of gas was then 4s. 6d., subject to the same discounts. There was also a charge made for meter-rents. But since the Corporation had taken over the works, they had gradually reduced the price of gas, till at the present moment it was only 2s. 3d.; and they had also abolished meter-rents. The consumers were still entitled to claim these very large discounts; and the result was that the large consumer now obtained his gas at almost cost price—that was, after deducting 20 per cent., he only paid 1s. 9¾d. per 1000 cubic feet, which he (Mr. Fitzgerald) need hardly say was far and away below the price of gas anywhere else in Ireland. The cost price of the gas was 1s. 7·821d. per 1000 feet; so that the only margin between the price paid by the large consumer and the cost price was 1¼d. The result of this state of things was that it became impossible to reduce the price any further to the small consumer; because if it were lowered to (say) 2s., the large consumer would be entitled to claim his 20 per cent. discount on the 2s., and would be actually procuring gas at less than cost price. This was a result certainly not foreseen by Parliament when the provisions as to discounts were inserted in the 1852 Gas Bill, and affirmed when the Corporation acquired the works. The idea at that time in giving such a considerable discount as this was that the large consumer, being so much more profitable to the Company, was entitled to a very substantial reduction. But in point of fact this was not so as a rule. The large consumers were generally millowners and manufacturers; and their consumption of gas was only large in the winter months. During the eight other months, the mains and plant which it was necessary for the Corporation to provide in order to give a supply of gas during winter time were lying idle, and giving no profit at all. The substitution of the provision giving a uniform discount of 5 per cent. on quarterly accounts if paid within three weeks of the time the account was sent in was a reasonable one, because it relieved the Corporation to some extent of the trouble of collection, and enabled them to get in their accounts promptly.

The first witness was Sir Samuel Black, the Town Clerk. He stated that, when the Corporation acquired the gas-works in 1874, the price of gas was 4s. 6d. per 1000 cubic feet, and the meter-rents varied from 1s. 6d. to 15s. per quarter, according to the size of the meters. The Corporation at that time were bound to continue the discounts, which started at 2½ per cent. and rose to 20 per cent.; but persons who did not consume more than 10,000 cubic feet per quarter were not allowed a discount. The price, under the administration of the Corporation, had been brought down to 2s. 3d.; and were it not for the discounts, they would be able to still further reduce it. Allowing the discounts, the large consumers were getting gas at 1s. 9¾d.; and if a further reduction were made, they would obtain it at cost price, with the result that the ratepayers as well as the Corporation would be out of pocket. Consequently, they were unable to make any reduction to the small consumers. Owing to the fact that these large consumers only burned gas about four months in the year, less profit was made out of them than from the ordinary consumers.

Witness was cross-examined first by Sir Alexander Miller, to whom he admitted that there was some trivial difference in the cost of collection in favour of the large consumers; but sometimes even millowners made bad debts. He believed they had not any bad debts with the railway companies. He was not aware that the Belfast and Northern Counties Railway Company had been consuming 400,000 cubic feet of gas per quarter; but he did know that they had now the electric light laid on to their premises. In 1897, the price of gas was 2s. 6d. By the Corporation Act of 1874, they were empowered, so long as the price did not exceed 3s. 9d. per 1000 cubic feet, to apply any profits they thought fit to public purposes. The balance carried to revenue account in 1897 was £64,800; and the interest on the stock raised to acquire it amounted to £10,800. Making a fair allowance for depreciation, interest, and certain mortgages, the net profit was £45,200; but they had to apply this to the revenue. It was true they would have been able to reduce the price of gas if they had not to expend money on revenue. They had to meet the expense of extending the works, and had not the capital to do it with; so that they had to take it out of revenue. When the Corporation acquired the works from the Company, he agreed that they took over their liabilities; but they were not bound to comply with all their provisions. Certainly they had to grant the same discount as the Company had been giving. There was a dispute between the Corporation and the consumers from 1874 to 1876 as to whether the amount of gas consumed was to be calculated as annual or quarterly consumption; and the Corporation were defeated. Then they had a clause put in their Bill to the effect that the consumption was to be taken as quarterly only. He did not think they could increase the discounts instead of lowering the price of gas. Answering Mr. Gordon, Sir Samuel agreed that, to a considerable extent, it was the large firms who had made Belfast. In 1874, the Corporation voluntarily inserted the provisions as to the discounts; but the price of gas was then 4s. 6d. per 1000 cubic feet. Again in 1878, they came to Parliament with reference to the discount clauses. The price at that time was 3s. 9d.; but they did not then suggest that the clauses should be excluded altogether. The capital of the Company when the Corporation acquired the works was £100,000; and the Corporation paid £386,550 for the property, subject to the debentures, amounting to £50,000. He believed the capital expenditure now amounted to more than £800,000. Virtually, they had been able to write off half-a-million of capital. The sum written off last year was £18,000. Some of the profits went to the general

benefit of the city; and, under the powers of their Act, they expended £35,000 on new plant. They were allowing the discounts in 1897-8; but he could not say the net profit was about £30,000, or 9d. per 1000 cubic feet. He should be very much surprised indeed if he were told they were making about 50 per cent. profit. In reply to the question whether he suggested that large consumers of gas, such as the York Street Spinning Company, who paid £1000 a quarter, ought not to get more discount than a man who paid £5 a quarter, witness held to the opinion that the discount should be uniform. In answer to further questions, he said that, however small the consumption of gas was in the summer, consumers who took a large amount in the winter were given 20 per cent. discount all the year round. The accounts were sent in twice a year. The ratepayers and Corporation were entirely in favour of a uniform discount. Questioned by Mr. Newson, witness said he did not know that the annual consumption by the Harbour Commissioners was 15 million cubic feet; but the electric light had been installed on the quays for a considerable time. Replying to Mr. Fitzgerald, witness repeated his assertion that, if the price of gas in the existing state of things were reduced in Belfast, the large consumers would get their gas at less than cost price. It was to get out of this difficulty that the Corporation were promoting this part of the Bill.

Mr. James Stelfox, the Corporation Gas Engineer and Manager, was next examined; stating at the outset that he had held his present position since 1875. Previous to that he had been in the employ of the Gas Company, to whom his father was Engineer. In 1851, the present rates of discount were allowed. They were voluntary discounts given by the Company. In 1852 the Company were promoting a Bill in Parliament; and a clause was inserted that they were not to charge a higher price than 5s. per 1000 cubic feet for gas, and that they were to continue giving the discount. This was why it became obligatory upon them to allow the discount. In 1874, the works were transferred to the Corporation; and the discount was continued. Last year the price paid by the consumers, after deducting the discount, was 1s. 9⅜d.; the actual cost of production being 1s. 7$\frac{8}{11}$d. He anticipated that in the present year the cost of production would rise, because the price of materials had increased. It was expected that coal would be dearer this year; and if they had to go to the market at the present time for oil, they would certainly have to pay a greatly increased price for it. So that if the discounts were still allowed, the margin between the cost of production and the price paid by the large consumers would entirely disappear. They were also asking for power to borrow further money; so that a larger sum would have to be paid in future for capital. Therefore if the discounts were continued he did not, so far as the present minimum was concerned, see any reasonable probability of reducing the price of gas. The millowners were not the most profitable consumers at the present prices. Those who worked all night and used gas for manufacturing purposes were exceptions. But the ordinary millowner only consumed gas about four months in the year. There were some 35,000 consumers who did not get any discount; and in order to reduce the price of gas so that these consumers would get the benefit, it was absolutely necessary the system of discounts should be modified. It came to this—that if they supplied the large consumers with gas at a reduced price, the smaller consumers would have to pay for it.

In cross-examination, witness could not say for certain whether there was any quarter in last year in which millowners had taken less than 400,000 cubic feet of gas; but he should think there was. The cost of production depended upon the price of coal and oil. He agreed that the number of gas consumers had increased of late by about 7000 or 8000; but he could not say there had been a considerable increase in the consumption of gas for motive power. There was very little difference between the cost of producing a large quantity of gas and a small quantity. In Belfast, they made gas cheaper and better than the Companies did in London; but not much cheaper than the South Metropolitan Gas Company. He was aware that many of the large consumers in Belfast used to have their own gas plants, and that they did away with them when the Gas Company allowed the discount. He did not believe there would be much difference in the consumption if the discounts were reduced. Asked whether he did not think that, by increasing the price of gas, the Corporation would compel the manufacturers and other large consumers to provide means for supplying their own gas, he said he had not heard this was contemplated. The leakage was only about 3½ to 7 per cent. In re-examination, he asserted that, with a discount of only 5 per cent., the gas was cheaper than manufacturers could produce it themselves.

Re-called, Sir Samuel Black gave the following statistics bearing on the question for the year ending Dec. 31, 1898: The number of consumers was 36,500; while the total amount received in rents was £128,826. No less than 7500 consumers were entitled to discount, and received during the year £8830; the amount paid by them being £69,182. The sum paid by the 29,000 consumers who did not get discount was £50,813. The discount allowed was at the following rates: 6509 accounts at 2½ per cent., 515 at 5 per cent., 240 at 10 per cent., 122 at 15 per cent., and 114 at 20 per cent.

The Chairman intimated that the Committee did not desire to hear any other witnesses, unless they had something fresh to say; but Mr. Fitzgerald wished to call two more who were members of the Corporation. The first was Mr. M'Innes, one of the labour representatives. He stated that the feeling of the working classes was very strongly against preferential discounts; and the general opinion was that they should be abolished, and that all classes should have the same rebate. He admitted, in cross-examination, that he was not entitled to any discount. The Lord Mayor (Mr. Otto Jaffé) spoke of the discount question having been the subject of discussion both inside and outside the Council for many years. The general conclusion arrived at was that, in the interest of the public, the preferential discounts should be abolished, and that there should be one uniform rate. If the Corporation could get the power now sought, the probability was they would be able to make a reduction in the price.

Evidence was next called in support of the petition of the Railway Companies against the proposed reduction of the discount. Mr. Bailey, Accountant to the Northern Counties Railway Company, stated that their consumption of gas in 1896 was 453,160 cubic feet, in 1897 552,600 feet, and in 1898 565,130 feet. The discount at present allowed came to about £100 a year. The adoption of electric lighting had only diminished the consumption of gas to a very small extent.

Sir A. Miller, addressing the Committee, remarked that this matter had been before Parliament on three separate occasions, and each time the preferential system of discounts had been made one of the conditions precedent to the passing of the Bill. He thought it had been shown that, after taking into account all expenses and losses, the Corporation had a very large profit on the gas—so much so, indeed, that they could well afford to reduce the price without interfering with the present rates of discount. Even if the Corporation did succeed in modifying the rates of discount, they made no promise in the Bill that they would reduce the price of gas. What they proposed doing was to victimize the large consumers in order that they might recoup themselves for the benefit which they intended giving to the smaller ones.

Further opposition was offered by Mr. Gordon, who called Mr. Thompson, Chairman of Messrs. Lindsay, Thompson, and Co., Spinners, &c., who paid to the Corporation last year £360 for gas for motor purposes. The discount received by them at the present rate was £68 a year; and if the rates were reduced to 5 per cent. they would, witness asserted, find it to their advantage to substitute something else for gas. Witness was also connected with the Harbour Board; and he had never heard of an outcry against the preferential rates. Mr. E. H. Stevenson followed; stating that, from an examination of the accounts, he estimated that the cost price of gas in 1897-8 was 1s. 4·8d. He had taken into consideration leakage and all other losses; and, on the other hand, he had deducted the residuals from the cost of the coals, and also the interest received from the bank. The average discount allowed by the Corporation was 7 per cent. If they obtained powers to reduce the discount to a uniform rate of 5 per cent., they would not be able to lower the price by more than a halfpenny.

Mr. Gordon, addressing the Committee, said the matter was of very considerable importance to his clients. At present they were carrying on a very successful business at Belfast; and if the rate of discounts were reduced, it meant so serious a thing to them that they would have to look elsewhere for motor power and means of illumination. The Corporation were making at the present time a clear profit of 9d. per 1000 cubic feet; and he asked the Committee not to allow the clause to stand, even if it were only to protect the Corporation from themselves.

Thursday, May 11.

This morning evidence was tendered in support of the petition of the Belfast Harbour Commissioners.

Mr. G. F. L. Giles, the Engineer to the Commissioners, was the first witness. He informed the Committee that last year the total consumption of gas by the Commissioners was 12,576,100 cubic feet; and in addition to this they used 2,243,215 cubic feet in the lamps, of which there were 124. In respect of the gas consumed in each lamp, the Commissioners paid to the Corporation £2 12s. 6d. a year; so that practically they consumed 15,000,000 cubic feet of gas per annum. The discount last year amounted to £268; and excluding the discount, they paid the Corporation £1435. If the Bill passed, the discount at the 5 per cent. rate would amount to about £70—a loss of close upon £200 to the Commissioners. They laid down the whole of their gas and water pipes themselves, and repaired them; the cost amounting to about 7 per cent. of the sum paid to the Corporation for the gas consumed. In cross-examination, he stated that the Commissioners had adopted the electric light lately, and intended to do so to a greater extent. They would, however, still continue to use gas. The large consumers were much more profitable to the Corporation than the small ones. The Commissioners did not urge that they should get their gas cheaper than the poor man. What they held was that if they used a large quantity, it was only right they should be allowed an appreciable discount. He was aware that they had been getting the 20 per cent. discount all the time the gas had been gradually reduced in price. He agreed that if any benefit was to be given to anyone, it should be to the poorer class.

Mr. Balfour Browne addressed the Committee for the Commissioners, who, he pointed out, would lose £200 a year if the proposed clause were passed. If it were not for the principle underlying the matter, he did not suppose that £200 a year would make much difference to the Commissioners; but so far as the principle was concerned, he would ask the Committee to say they were with him. There was a very serious question before Parliament at present as to how far municipalities should be allowed to become traders. One of the points was, whether they should be permitted to become sellers of water; but he thought it was a much more dubious question whether a Corporation should be allowed to become purveyors of illuminants. He submitted that large consumers should have the benefit of wholesale prices. It was admitted that all over the country discounts were given to large consumers; and it was only right in principle. Gas could be supplied wholesale at a very much cheaper rate than retail. If the discount were reduced, the large consumers would have to find a substitute for gas or make their own; and the ultimate result would be to do harm to the small consumers rather than to benefit them. The proposal of the Corporation was absolutely wrong in principle; and he asked the Committee not to pass the preamble of the Bill so far as it provided for the reduction of the present rates of discount.

Mr. Fitzgerald, summing up on behalf of the Corporation, said this was a proposal on the part of his clients to establish a reasonable method of dealing with the charge for gas in Belfast—that was, to make a uniform charge to all consumers subject to a uniform discount. If the Board of Trade returns were examined, it would be found that there were a large number of places, including some of the most important towns, where no discount at all was given, and where there was a uniform charge to every consumer, whether large or small. There were other towns where small discounts were allowed varying from 2½ to 5 per cent.; and obviously a discount of this character was allowed for the purpose of getting in the accounts expeditiously, and so doing away with the expense and trouble of collecting. There was a third class of cases which was similar to the one before the Committee, and that was where a preferential discount was given—the amount varying according to the consumption of gas. In some instances as high a rate of discount as 20 per cent. was allowed; and in one or two, as much as 23 per cent. But in all these cases, the price of gas was very much higher than that charged in Belfast. The effect of the present rate of discount upon the low price of gas was a very serious matter to the Corporation. The return put in by Sir Samuel

Black showed that there were 36,500 consumers, and out of that number there were 29,000 who might pay their gas accounts on the day they were sent in, and who, nevertheless, obtained no discount at all. There were 7500 consumers who had a discount, six-sevenths of whom received it at the rate of 2½ per cent. Therefore, these six-sevenths would be placed in a better position by the Bill than they were at present. About 350 persons were allowed 5 per cent. under the present arrangement, and, accordingly, would not be affected at all by the Bill. It was only the remaining 476 persons, 114 of whom had 20 per cent. discount, who objected. Therefore the Committee would see that the Bill affected a very small number of persons. Mr. Stelfox had pointed out that, if the 20 per cent. discount were continued, the margin between the cost of production and the price paid for the gas would disappear; so that the 114 large consumers would get their gas at, or even below, cost price. This was a state of things that could not be allowed to continue, because the effect of it was that the small consumers would have to make up what was lost on the large accounts. In his calculations, Mr. Stevenson, who was called by Mr. Gordon, had failed to take into consideration the interest on capital account and the sinking fund. A point which had been made with reference to the question of preferential discounts was that the large consumer was the more profitable; and no doubt, if the Corporation were in the position of a commercial company, he would be. But they were not in that position; and, therefore, with them the large consumer was not more profitable than the small. In conclusion, he submitted that it was most desirable that all preferential rates of discount should be abolished, and that there should be one price and one discount.

After deliberating for a few minutes in private, the Chairman announced that the Committee found that the preamble of the Bill, so far as the discount clause was concerned, was not proved.

The next clause (No. 24) referred to the laying of gas-mains in proximity to water-mains. It read—

From and after the passing of this Act, section 138 of the Belfast Water Commissioners' Act, 1840, shall be, and the same is hereby, repealed, and the Corporation shall in laying any new gas main or pipe, or in removing or relaying any existing gas main or pipe, be subject to the provisions of the Gas-Works Clauses Act, 1847, for the protection of water mains and pipes in streets which may be opened or broken up by the undertakers.

Mr. Fitzgerald announced that it had been agreed between the Corporation and persons opposing this clause that it should be struck out, and the following one substituted:—

Section 138 of the Belfast Water Act, 1840, in its application to the city shall, as from and after the passing of this Act, be modified and amended as follows: (1) Where gas-mains shall be laid by the Corporation, they shall not, without the consent of the Belfast Water Commissioners, be placed nearer than 2 feet to any water-main of the said Commissioners, or nearer than 1 foot to any hydrant of the said Commissioners; (2) where water-mains shall be laid by the said Commissioners, they shall not, without the consent of the Corporation, be placed nearer than 2 feet to any gas-main of the Corporation; (3) where a water-main is laid across a gas-main, or a gas-main laid across a water-main, the new main shall, unless with the consent of the Corporation or Commissioners (as the case may be) owning the main to be crossed, be placed as nearly as practicable at a right angle to the main to be crossed; (4) where the Corporation execute any works affecting any pipe work or apparatus of the said Commissioners, they shall, except as hereinbefore provided in the case of mains, proceed subject to, and in accordance with, the provisions of the Gas-Works Clauses Act, 1847, with respect to the protection of water-pipes and apparatus; (5) where the Commissioners execute any works affecting any pipe work or apparatus of the gas undertaking of the Corporation, they shall, except as hereinbefore provided in the case of water-mains, proceed subject to, and in accordance with, the provisions of the Water-Works Clauses Act, 1847, with respect to the protection of gas-pipes and apparatus.

This disposed of the gas clauses in the Bill.

THE GAS SUPPLY IN THE BRADFORD OUT-DISTRICTS.

As mentioned in our "Gleanings from the Committee-Rooms" last week, the Bill promoted by the Bradford Corporation primarily to authorize them to construct additional tramways in and near the city, but incidentally to purchase the portions of the Shipley and Pudsey Gas Companies' undertakings lying within their boundaries, had been under consideration by a Select Committee of the House of Commons presided over by Mr. Molloy, who had passed the tramway portion of the measure, but had been less considerate to the promoters in regard to the gas section, though at one time there was every appearance of success. The proceedings on this part of the Bill were briefly indicated last week; and the following abstract report will supply additional particulars.

There was necessarily a strong array of Counsel to represent the various parties interested. For the promoters, Mr. Balfour Browne, Q.C., Mr. Freeman, Q.C., and Mr. W. J. Waugh appeared; while the Shipley Gas Company were represented by Mr. Claude Baggallay, Q.C., and Mr. Forbes Lankester; the Pudsey Gas Company, by Mr. Worsley Taylor, Q.C., and Mr. Russell Griffiths; and the Shipley Urban District Council, by the Hon. J. D. Fitzgerald, Q.C., and Mr. W. L. Williams.

At the close of the proceedings on the tramway section of the Bill on the 12th inst., Mr. Balfour Browne opened the gas portion. He stated that the measure contemplated the acquisition of a portion of the undertakings of the Gas Companies of Shipley and Pudsey; and both of these Companies were opposing. He pointed out that in 1871 the Corporation of Bradford acquired the present gas-works, which enabled them to supply the people within the whole of the borough boundary. By the Bradford Act of 1881, the boundary was extended; but the rights of the Gas Companies supplying the new districts included were protected by special clauses. This had brought about a serious anomaly. In that portion of the borough supplied with gas by the Pudsey Company, the charge was 2s. 6d. per 1000 cubic feet; discounts being allowed from 2½ to 10 per cent. for prompt payment. In the next street, the Corporation supplied their customers at 2s. 3d., and gave discounts ranging from 2½ to 12 per cent. It was an anomaly, of course, that the population on one side of a street should have their gas at one rate, while the population on the other side should pay more. It was therefore proposed by the Corporation to purchase that part of the undertaking within the city boundary, and do away with the anomaly. In the Shipley case, the Gas Company charged 3s. 4d. per 1000 cubic feet, less 7d. discount. The people who paid this high rate within the Bradford boundary were citizens of the town who contributed to the rates; and they bitterly complained of the charges made. No harm could possibly be done to the Companies. They might say: "You are taking away a very valuable part of our district." But supposing they were, the Corporation were proposing to purchase on arbitration terms; and the arbitrator would consider what the Companies had been receiving from these districts, and what amount would fairly compensate them. If the districts were a valuable part of the areas of supply, the arbitrator would give good compensation; but if they were poor parts, the amount would be less. If the Companies argued that taking these parts away would make it more expensive for them to supply the rest of their district, it would be a matter of proof; and if they could show that this would be so, they would, of course, receive adequate compensation. His case, however, was that it would not. He imagined that the opponents of the Bill came there in order to be able to say: "This is a compulsory sale, and we want to be able to take advantage of that which has become the practice on the part of some arbitrators—viz., to add 10 per cent. to the value for compulsory purchase. If this was their only object, he would at once admit that the purchase was compulsory; but if, despite that admission, the petitioners persisted in their opposition, he did not think the Committee would allow the object he described to weigh with them in deciding upon the preamble of the Bill. If it was said there was no precedent for breaking up a gas undertaking in the manner proposed in the Bill, he would refer the Committee to the case of Southampton, in which a precisely similar thing had been done. In reply to an inquiry by the Chairman, Counsel said he did not think there had been any question of terms; but, if the petitioners would not put the Corporation to any further trouble, they would admit that this was a compulsory sale.

Evidence was then given in support of the opening statement by Counsel. The first witness called was Alderman T. Speight, formerly Mayor of Bradford, and now Chairman of the Gas Committee of the Corporation. He declared that the anomaly as to price which had been described gave great dissatisfaction. Whenever candidates had been put forward for municipal honours, one of the main questions had been: "Are you in favour of going for a scheme to make us all equal as to gas charges? If you are not, you are not likely to get many votes." Mr. Russell Griffiths cross-examined the witness with the view of showing that in connection with the Acts for the extension of the city boundary there had been a fight over the clause protecting the rights of the Gas Companies, and that the Companies had been victorious. But Mr. Speight denied knowledge of the fact. In cross-examination by Mr. Forbes Lankester, witness said he knew as a matter of fact that at this moment 99 per cent. of the consumers of gas in the Shipley district took advantage of the discount which reduced the price to 2s. 9d. Shipley itself was the most valuable portion of the area of supply of the Shipley Company. Re-examined by Mr. Freeman, Alderman Speight said the Corporation simply wanted to buy the parts of the undertakings which were in Bradford, and to pay a fair price for them. In answer to the Chairman, he added that no question had arisen between the Corporation and the Gas Companies as to the valuation of the parts of the undertakings which it was proposed to acquire.

The Chairman of the Gas Committee was followed by the Corporation Gas Engineer (Mr. Charles Wood). He said he only knew the case of Huddersfield where a Corporation having gas-works of their own had some portion of their area supplied by an outside Company. He explained at length the necessities of the districts surrounding Bradford, and compared the charges made by the Corporation to their consumers with those of the Companies, to show that the Corporation's prices were, on an average, much more favourable to the consumers than those of the Companies. The compensation provided for in the Bill was very fair; and he did not see how the Companies would be damnified. In cross-examination, witness said it was true that the Corporation had endeavoured to obtain the powers they now sought, but in a different way. The reason they desired to have the transfer was, in the first place, the difference in price; and, in the second, because they felt that only they ought to have the power of breaking up the streets. In 1881 the Corporation made great complaints against the supply of the Pudsey Company, and the charge was then 9d. higher than that of the Corporation, the difference now being only 3d.; and the Committee had refused to give the Corporation the powers they were now seeking. All the same, he did not think the present demand was unreasonable. It was quite possible that the Company had gone on spending their capital on the faith that the finding of the Committee in 1881 would be upheld in the future. At this point the Chairman intimated to the promoters that the Committee were satisfied with their evidence; and the proceedings were adjourned.

On the resumption of the inquiry on the following Monday, Mr. Worsley Taylor was about to open the opposition for the Pudsey Gas Company when the Chairman interposed, and said the Committee were of opinion that the question at issue was one for agreement between the parties concerned rather than for settlement by the Committee. Assuming that they decided in favour of the Bradford Corporation, they would consider that the compensation to be given to both the Shipley and Pudsey Gas Companies should be such that neither should suffer in any sense in their financial position. Mr. Freeman said he was quite prepared to discuss a clause to carry out the intention of the Committee if his friend Mr. Worsley Taylor was agreeable.

Mr. Worsley Taylor said it was obvious that the Committee had been very much influenced by what had been put before them as being the modern accepted doctrine of Parliament—viz., that it was in favour of the transfer in all undertakings of this kind to corporations. But this was by no means a matter of course, as he hoped to show the Committee by reference to the practice of the House and to certain precedents, as well as to the significant omissions of Counsel for the promoters. There was no precedent whatever for the proposal before the Committee. He should ask them, in justice to him, in accordance with public policy and the maintenance of parliamentary practice, and the absence of all precedents, to say that a precedent established now would be an exceedingly evil one. For these reasons he was not prepared to discuss a clause.

The one proposed was flagrantly unjust, and without precedent. He should fight the question on the preamble, and not on clauses. The matter to be decided was a simple one. Here they had a statutory undertaking sanctioned by Parliament in 1845—more than half-a-century ago—and down to the present time the money of the shareholders had been invested year by year in accordance with successive Charters granted to them by Parliament; and from the day that the Company came into existence until now there had not been a single complaint of any kind against them. The Committee had before them a proposal by the Corporation to buy from the Company against their will, and subject to the risk of arbitration—not the whole of the undertaking, which might be dealt with equitably—but a part of it, and that the most profitable part. The money which had been invested had been provided on the understanding that the whole of the area should be left to the Company. If they granted the proposals of the Bill, they would absolutely reverse two former decisions of Parliament, arrived at after a full consideration of all the facts between the very same parties who were now before them. Unless they found that Parliament was wrong on the two previous occasions, he ventured to think they would not lightly upset the decisions of their own House and also of the House of Lords. The whole question in dispute was that on a rental value of £23,000 there would be £270 more paid to the Pudsey Gas Company than to the Bradford Corporation; and on this slender ground, they asked the Committee to do this monstrous injustice. It was not his duty to advise the Corporation of Bradford; but he made a counter-suggestion to theirs, to the effect that the promoters should have a rate-in-aid, and pay this difference of £270 a year to the Pudsey people. On every previous occasion when the Pudsey Company had been brought to Parliament, they had refused to sell their undertaking; and they had been supported by the decisions of Parliamentary Committees. This was the position they took up on the present occasion. In 1881 the Bradford Corporation brought in a Bill to include part of Pudsey and Shipley within their district. If nothing had been said in that Bill about gas, the Corporation would have been able to supply in the included districts. Accordingly they were opposed by the Pudsey Company, who said: "You are within our limits of supply, and if you get your Bill it must be on the terms that you must not have power to compete with us." Sir Edmund Beckett—now Lord Grimthorpe—who was for the promoters, offered, as it was unreasonable to allow the Corporation to come in and compete with the Company, to insert in the Bill a clause declaring that within six months the Corporation should purchase the pipes and mains of the Company, and pay them for the undertaking in proportion to the profits then made. This was substantially the clause now proposed. Subsequently Sir Edmund said the clause was not right. If compulsory purchase was not right then, why was it right now, especially as in those days the difference in price between the gas supplied by the Corporation and the Company was 1s. 3d. in favour of the former, whereas now it was only 3d.? Mr. Balfour Browne here interposed to explain that when Sir Edmund Beckett said the clause was not right, he meant that it was not within the notices served on the opponents. Mr. Worsley Taylor said that Sir Edmund had asked for leave to compete; but the Committee decided that there should be neither purchase nor competition. They only gave the Corporation their Bill on condition that it did not prejudice or affect the Pudsey gas district in any way. The Corporation took the Bill on this condition; and he maintained that this amounted to a parliamentary bargain. He pointed out that in 1887 the Pudsey Company applied to Parliament for power to raise additional capital, and that the Bradford Corporation then took the opportunity to renew their attempt to acquire the part of the Company's undertaking within the city boundary; but Parliament again rejected their request.

The Chairman, after consulting with his colleagues, asked Mr. Worsley Taylor whether he had any evidence to call on the question of precedents. The Committee thoroughly understood the Bradford case. The question of difference in price—3d. per 1000 cubic feet—was a comparatively small matter; and the Committee would not think of altering the decision of Parliament on so slight a ground.

Mr. Corbet Woodall was then called. He said he regarded the transfer of a portion of a gas undertaking as a much more serious proposal than that for the purchase of the whole of the concern, and for reasons which he gave in detail; the principal one being that instead of the consumer being benefited he was very much injured. He pointed out that since 1881 there had been no interruption in the growth of the businesses within the areas affected. On the other hand, the consumption of gas in Pudsey during the years 1896-8 had slightly fallen off, while in the Thornbury district it had increased a little. The works of the Company had been well managed; and if they went on as they were now doing, he saw no reason why Pudsey should not, in the near future, supply gas at the same cost as the Corporation. If they were left in possession of the whole of their area, it was at least probable that the difference of 3d. between the Corporation and the Company would be reduced. Within his knowledge, there was no precedent whatever for the compulsory transfer of a portion of a gas company's undertaking. In cross-examination by Mr. Freeman, Mr. Woodall said he would not go so far as to assert that in recent years the whole tendency of Parliament had been to transfer gas and water undertakings to municipal authorities, but there had been a large number of transfers. The Morley case was not one of compulsory purchase. There was practically an agreement before the parties came to Parliament. He did not know another case, with the exception of Huddersfield, where a Gas Company supplied a portion of the municipal area in which the Corporation had gas-works of their own. His objections to the Bill were, first, that it would be difficult to arrive at fair arbitration terms; and, secondly, that it would work injuriously to the consumers.

Mr. Baggallay then, on behalf of the Shipley Gas Company, called Mr. E. H. Stevenson, who said he was not aware of any precedent for the compulsory purchase of a portion of a gas company's undertaking; and he had abstracted every Act of Parliament relating to gas and water works from 1865 down to the present time. As to precedents granting power for the compulsory purchase of a portion of gas undertakings, where Parliament had protected a small company or private individual who was supplying gas to certain districts from other parliamentary gas companies, or from a local authority, whose district included that area of supply, he took this as being a precedent absolutely contrary to the one now suggested. There was no doubt that the consumer, as well as the shareholder, was directly affected and injured by the partition of a Company like this. He quoted cases in support of this view. In cross-examination by Mr. Freeman, he said the principle underlying the cases he quoted was protection against competition, or against interference of any kind. He had known instances where gas undertakings had been purchased compulsorily as a whole; but in these there had always been complaints against the companies concerned. If the proposal in the Bill were carried out, the whole system of the Shipley Company would be deranged, and then the Bradford Corporation would be able to step in and buy the concern for the price of old iron.

Mr. Stevenson was followed by Mr. Thomas Newbigging, who said that in the whole of a very long experience he had not known a precedent for the compulsory purchase of part of a gas undertaking. Such a severance would affect not only the consumer, but also the shareholder.

Mr. Baggallay then addressed the Committee for the Shipley Company. He submitted not only that the acquisition of a part of a company's undertaking was unprecedented, but that Parliament had several times rejected proposals of the kind. The separation of the Company's undertaking might compel the consumers who would be left to them to pay a higher price for their gas than they did now. He reminded the Committee that the state of things against which the Corporation were complaining had existed for 28 years—since 1871, when the Corporation became the Gas Authority in Bradford. There was nothing to be founded, he contended, on the difference in the price of gas between the Shipley Company and the Bradford Corporation. In the case of Bradford, there were 1598 million cubic feet of gas supplied in an area of 7221 acres; while the Shipley Company's supply was 147 millions in an area of 6570. The supply per acre was more than ten times greater in the Bradford Corporation's district than in that of the Shipley Company. They must, therefore, in Shipley, have a larger proportion of unremunerative mains. Besides, the effect of the Bill, if passed, would be to deprive the Shipley Company of the most remunerative part of their area of supply. He asked the Committee to reject that part of the preamble of the Bill bearing upon the gas undertakings.

In replying for the promoters, Mr. Balfour Browne denied that the gas clauses of the Bill were unjust. He declared that the object of the promoters was that the whole of the people of Bradford, who were responsible for the expenses of the town, should be treated alike in the matter of rates and charges. If the Companies could show that they would be unable to make gas as cheaply if the Corporation took away a portion of their district, they would receive full compensation under the arbitration clause. The petitioners were trading concerns, and they would receive ample compensation for the loss of parts of their undertakings. What more could they claim?

The Committee deliberated in private. After a short interval, the Chairman announced that they found that the preamble had not been proved so far as the neighbouring gas undertakings were concerned. The other parts of the Bill were then considered.

Wilmslow Gas Company.—At the annual meeting of the Wilmslow and Alderley Edge Gas Company last Wednesday, a dividend of 10 per cent. on the old shares, and 7 per cent. on the new was declared. The profits for the year reached a total of £2678; and £607 is being carried forward to meet the cost of the renewals of plant now in progress at the works. To provide for the increased demand for gas in Wilmslow, Alderley Edge, and adjacent districts, it has been found necessary to carry out further extensions; and it is now proposed to raise additional capital by borrowing £1000, and by further calls of £3 per share on the 750 new shares of the Company. There has been a considerable increase in the consumption of gas during the year; and the Directors have decided to reduce the price from 3s. 2d. to 2s. 11d. per 1000 cubic feet, and to lay services and fix prepayment meters free, giving 25 cubic feet of gas for a penny.

The Advantages of Continental Travel for Gas Engineers.—The Gas Committee of the Halifax Corporation recently paid their annual visit to the gas and electricity works. There were also present the Mayor (Mr. Simpson) and several former members of the Committee. At the close of the inspection, the party returned to the offices, where tea was provided. Afterwards, at an informal meeting, a number of matters concerning the welfare of the two undertakings were discussed. During the evening the Chairman (Alderman Woodhead) read an account of the visit paid to Amsterdam, Brussels, and The Hague, by himself and the Gas Engineer (Mr. T. Holgate) in the autumn of 1897, and recorded the advantages accruing from a visit to the modern Continental gas-works. The Engineer also read a statement as to the technical features met with; mentioning the able arrangements for receiving coal, for the discharge of coke and the distillation of tar, the use of inclined retorts, and the making of briquettes from coke breeze. He alluded to the fact that hydraulic power for stoking is largely in vogue, and that carburetted water gas is made at Brussels with very satisfactory results.

Monte Video Gas Company, Limited.—The report of this Company for the year 1898, to be presented at the meeting of shareholders on the 26th inst., shows a profit of £19,083 on the year's working. Adding interest and discount, the total is £21,096. After providing for interest on debentures, loss on exchange, bad and doubtful debts, and depreciation, the balance available for distribution is £16,552. The Directors paid in November an interim dividend of 10s. per share, less tax; and they now recommend a further similar amount, also less tax—making together a dividend of 5 per cent. for the year. This will absorb £27,096, requiring £10,543 to be taken from the contingency account, which will then stand at £7756. The balance at the credit of the reserve account, after deduction of the £14,540 applied in redemption of the debentures paid off to Jan. 1, 1898, and of those payable on Jan. 1, 1899, is £59,460, and the insurance fund remains at £12,500. The past year has been officially described as one of "exceptional agitation and unrest." The Directors therefore have the more satisfaction in reporting that, compared with 1897, the Company's net profit was £1049 more, the sales of gas were only 1·17 per cent. less, and the number of meters in use and consumers increased by 6·78 and 11·75 per cent. respectively. They regard the last two items as specially promising for the future; being by far the largest increases of late years.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, May 16.

(*Before the* MASTER OF THE ROLLS *and Lords Justices* RIGBY *and* VAUGHAN WILLIAMS.)

Jordeson v. Sutton, Southcoates, and Drypool Gas Company.

Judgment in this appeal (*ante*, pp. 807, 992) was delivered this morning.

The MASTER OF THE ROLLS said this was an appeal from a judgment of Mr. Justice North, granting an injunction to restrain the defendants from raising their gasholder so as to obstruct the ancient lights in some buildings of the plaintiff, and ordering the defendants to pay to the plaintiff £340 in respect of damage to his buildings caused by subsidence of the land on which they stood, by reason of the construction of the defendants' works. The defendants contended, first of all, that, assuming the plaintiff's lights would be darkened, and that the defendants had damaged his buildings, still no action lay against them, having regard to their parliamentary powers; secondly, as regarded the lights, that assuming an action would lie, no injunction ought to be granted, but damages only should be awarded; and thirdly, that as regarded the damage caused by subsidence, no action lay, because such subsidence was caused by pumping water out of the defendants' own land, thereby drawing water from under the plaintiff's land, which they contended gave no right of action. Before examining these conditions, it would be convenient to state the undisputed facts giving rise to the litigation. The plaintiff was the owner of some land near Hull; and on this land there were houses, some of the windows of which had existed for more than twenty years before the commencement of the action. The defendants were a Gas Company, empowered by statute to make and supply gas, whose works were within a short distance of the plaintiff's houses. They had power to buy land by agreement, but not compulsorily. Their statutes incorporated the Land Clauses Consolidation Act, and the Gas-Works Clauses Acts of 1847 and 1871. The Company's Acts clearly authorized some nuisances—for example, the breaking up of streets—and whatever the Acts of Parliament authorized, of course, gave rise to no cause of action unless there was negligence. In the district where the plaintiff's land and the defendants' works were situated there was a large stratum of running silt, well known to people at Hull as a constant source of trouble to all who had to make excavations into it. It extended for some miles, and was about 6 feet thick; and at the place in question it was about 22 feet below the surface. The land on which the plaintiff's houses stood was, in fact, supported by this stratum of silt. Before 1877, the defendants' works were comparatively small. Their gasholders were of no great height; and no injury was done to the plaintiff. But in 1877, they resolved to extend their works, and construct a much larger holder; its diameter being 552 feet, and its height 105 feet above the ground level. They accordingly began to excavate the land to receive this holder, and cut down to and through the silt; taking all reasonable precautions to keep back the silt as they cut through it. They kept the excavation as dry as they could by frequent pumping. Notwithstanding all their care, the land subsided; and this subsidence caused damage. So far there was no dispute about the facts; nor was it alleged that the plaintiff's houses had, by their weight, caused a greater subsidence than would have otherwise taken place. There was a conflict of evidence on the question how far this running silt was liquid rather than solid—as to whether it was muddy water as distinguished from wet sand, and as to what the defendants removed by their pumping and other operations from under the plaintiff's houses; but it was admitted that the structural damage of which the plaintiff complained was caused by the defendants in the execution of their works. That the structural damage of which the plaintiff complained was caused by the defendants' works, there was no dispute whatever. With regard to the obstruction of light, it was not now really disputed that the gasholder would materially darken some of the plaintiffs lights, if it were erected to a greater height than it was now—about 70 feet. The injunction restrained the defendants carrying it higher, but did not prevent them using it as at present. He would now deal with the contentions of the appellants; and, first, as to the protection afforded them by their Special Acts and the statutes incorporated therewith. The defendants contended that whatever their liability would be apart from these Acts, they were protected by them against such an action; and for this they relied on the *London, Brighton, and South Coast Railway Company v. Truman* (11 Appeal Cases). In his opinion, the nuisance clauses contained in the Acts in question rendered this decision wholly inapplicable. The clauses were the 29th section of the Gas-Works Clauses Act, 1847, the 9th section of the Gas Works Clauses Act, 1871, and clause 53 of the Company's Special Act of 1867. Section 9 of the Act of 1871 was the most important, because section 29 of the Act of 1847 might probably be confined to nuisances by gas; and section 53 of the Act of 1867 related primarily to apparatus for making gas, and the proviso at the end, though general, ought perhaps to be read as qualifying the earlier part of the section. Section 9 of the Act of 1871 was clear and unambiguous. Thus: "Nothing in this or the Special Acts shall exonerate the undertakers from any indictment, action, or other proceedings for nuisance in the event of any nuisance being caused by them." This section was made applicable to the Company by sections 2 and 3 of their Special Act of 1873; and it was, in his opinion, conclusive against the defendants. If they could show any enactment expressly, or by necessary implication, authorizing them in terms to erect a gasholder at the place where this was, of the dimensions designed by them, or any express or necessarily implied authority to cut through the stratum of running silt, and if they could show that it was impossible to exercise these powers without causing damage to their neighbours, then the decision of the *London, Brighton, and South Coast Railway Company v. Truman* would protect them. But the statutes under consideration fell far short of what was necessary to exclude the application of section 9 of the Act of 1871. Upon this part of the case, the decision of the *Attorney-General v. The Leeds Corporation* (5 Ch. Appeals) was very instructive; and there were other cases to the same effect. Other minor contentions were raised by Counsel for the appellants; but in the view he took of the section, it was not necessary to refer to them. With regard to the injunction against carrying the gasholder higher than it was, the Court had recently considered when damages ought, and when they ought not, to be awarded instead of an injunction. In *Moreton v. Price*, and in *Shelfer v. The City of London Electric Lighting Company*, it was held that an injunction ought not to be refused if the plaintiff's rights would not be adequately protected or vindicated by damages. The liability of the defendants to pay damages in respect of the subsidence of the plaintiff's buildings required careful consideration. That the defendants had, in fact, caused such subsidence and damage, was clear beyond all controversy; and *primâ facie* they had no right to do this. It was for them to justify their conduct, if they could. Their attempt to do so by the special statutory powers failed, for the reasons already given. But they said that even if that were so, they were not liable at Common Law for damage by subsidence, first, because they only pumped water from their own land; and, secondly, because, though some sand came in with the water so pumped, the stratum of running silt under the plaintiff's land only shrank by reason of the abstraction of water from it, and that no soil, in any appreciable quantity, was removed from under the plaintiff's buildings. They said, in short, that the subsidence was caused by the withdrawal of underground water from the plaintiff's land by lawful pumping on their own land; and if damage ensued, no nuisance or other actionable wrong was committed by them. For this, they relied on the case of *Popplewell v. Hodgkinson* (L. R., 4 Ex.). The questions thus raised were extremely important, and by no means free from difficulty. First, as to the facts. No borings were made on the plaintiff's land; but it was contended that in its natural state the land contained the stratum of pure water resting on a bed of wet sand; the amount of water varying greatly with the rainfall. But in its ordinary state, if it were cut through, its equilibrium would be disturbed, and it would run down where it was cut through if not prevented from so doing. An excavation cut into or through it would disturb its equilibrium for some distance all round. The conclusion at which he had arrived from the evidence was that the operations of the defendants, carefully and skilfully conducted as they were, consisted in removing large quantities of silt from their own land, and in pumping on their own land whatever they could get away by pumping; and that the combined effect of both operations was to disturb the equilibrium of the wet sand underneath plaintiff's houses, and to cause such sand to shift its place and move towards the excavation made by the defendants. The plaintiff's houses were supported by a bed of wet sand, and not by a stream of water; and they had been let down by a shifting of such sand caused by the removal by the defendants of sand and water from their own soil. This was also the conclusion at which Mr. Justice North arrived, if they understood him rightly; and it was not necessary to examine in detail the voluminous evidence bearing on this point, all of which he had studied with care. In this view, it was unnecessary to decide whether, if the defendants had done nothing more than pump underground water from their own land, and thereby let down the plaintiff's houses, an action could have been maintained against them. *Popplewell v. Hodgkinson* had generally been regarded as an authority that no action would lie in such a case. But he was not satisfied that this broad question could be considered as finally settled by that or any other decision. The question involved very important considerations. Two conflicting rights had to be reconciled—viz., the right to support and the right to pump water. It was not necessary to decide which had to give way to the other. He should assume in the defendants' favour that an action would not lie for damage caused by pumping water only. They had done more; and what they had done was, in his opinion, an actionable nuisance at Common Law. If this point was decided in favour of the plaintiff, the defendants did not quarrel with the damages assessed. The only case he knew of in which the legal consequences of cutting through quicksand had been considered was the American case of *Cabot v. Kingman* (166 Mass., 403), to which Mr. Haldane referred. The Court was the Supreme Court of Massachusetts; and the majority of four to three adopted the conclusion he had expressed. The grounds of their opinion were given on p. 405, and he could not conclude his judgment better than by reading what he there found. Chief Justice Field said: "Whatever may be true of percolating waters, we think that the defendants had no right to take away the soil of the plaintiff in land which they had not taken under the statutes; and that it is immaterial that the soil was removed by means of pumps from the trench into which it had fallen by its own weight, or had been carried by percolating water. We are unable to distinguish the case from one where the soil falls in from the surface in consequence of an excavation in the adjoining land. The plaintiff, if the facts be as he offered to prove, has been deprived of the lateral support to his land, in consequence of which the quicksand has run from under the surface of his land into the trench, and has been removed by means of pumps; and this has caused the surface to settle and crack. It was the duty of the defendants to prevent this in some manner, if they did not take the plaintiff's land." The judgment of Mr. Justice North was, in his opinion, correct on all points; and the appeal must be dismissed with costs.

Lord Justice RIGBY said he agreed entirely with what had been said by the Master of the Rolls on the construction of the Acts of Parliament, and also in his conclusion as to the ancient lights. He would only add that, in his opinion, the Courts ought to take great care to prevent undertakers with statutory powers from exceeding those powers to the detriment of adjoining landowners; and this ought to be a leading consideration when the question of the remedy by injunction or damages was being considered. It had been argued that the case of *Popplewell v. Hodgkinson* had established the rule that under no circumstances could there be any right to support to land from water. But, even if this were so, it did not follow that a bed of running silt could be drawn away; and, in his judgment, the extreme logical conclusion from the proposition really established by that decision would not lead to such a result. He was, however, by no means prepared to give the decision so far-reaching an effect as had been contended for.

Lord Justice VAUGHAN WILLIAMS differed. He came to the conclusion, upon the evidence, that the subsidence of the plaintiff's land had been caused merely by the withdrawal of water support produced by excavations by the defendants on their own land. This state of things raised the question whether there was, by the Common Law, an obligation not so to deal with land as to withdraw water support of the surface of

land owned by others—or, to state the question conversely, whether there was a right to water support for land. In his judgment, *Popplewell v. Hodgkinson* was a clear authority that there was no such obligation, and no such duty. His Lordship then reviewed the authorities on the subject at considerable length; and he continued as follows: The reasoning upon which the claim to water support for the surface of land, whether by subjacent water or by water laterally adjacent to subjacent water (in other words, by a body of water subjacent to two properties), is based, is upon a general proposition that land must have the support of the subjacent and laterally adjacent strata, to whatever extent the presence of those strata is requisite for its stability; and it is said that this reasoning applies equally whether the stratum consists of soil or partly of soil and partly of water. But it seems to me that the right of support by water to soil does not depend upon the same considerations as the right of support by soil. I say this quite apart from the difficulty of applying the term support at all in the case of a body of water lying under two properties, and a complaint of a withdrawal of water support by the flow occasioned by tapping the water on the adjoining land. It is to be remembered that the right of support from adjoining property is, in all cases, an exception from, or limitation of, that incident of the ownership of land which entitles a man to deal with his land in the manner most beneficial to himself—that the line between incidents of ownership and the exception in favour of neighbouring owners must be drawn in accordance with the convenience of the community. To lay down a general rule that there is a right to have soil supported by neighbouring soil, is to lay down a rule which generally will not interfere to any considerable extent with the beneficial enjoyment of the servient tenement. The right of support from neighbouring soil which the convenience of society requires that landowners should enjoy and accord *inter se*, is a right which generally will not be invaded unwittingly, for the subsidence of neighbouring land which results from digging or excavation by the owners of adjacent land can generally be predicted. The obligation of a landowner to afford support is therefore definite and limited; but an obligation not to withdraw water support from under your neighbour's land by digging or excavation in your own land, is an obligation which may well be unwittingly contravened. It cannot be predicted with any certainty what effect the withdrawal of water from under neighbouring land may have on the maintenance of the level of its surface; and especially will this be difficult to predict in cases where the support afforded by water only consists in the maintenance by the equal pressure of the water of the soil subjacent to the surface in a state of equilibrium. It is practically impossible in such a case to predict at what point or at what distance the withdrawal of the equal pressure of the water may cause motion or subsidence in the soil previously affected by water pressure. To affirm the right of support, is to affirm that no land can be drained, or well or trench dug, without the risk of an action for letting down the surface of neighbouring land. I cannot persuade myself that such a right is for the interests of society, or essential to the beneficial ownership of land; and, if the right is based upon an implied grant supposed to be made when lands belonging to one proprietor were divided by him between two or more other persons, it seems going very far to invent obligations in respect of unknowable and changeable subject matters like underground water. On the whole, I think that both the decided cases and the reason of the thing negative the right of support by water; and this conclusion is fortified by the absence of any affirmation of such a right in the English authorities and text-books, and by the terms in which the right of support is dealt with in the Roman law. In conclusion, his Lordship said, with regard to the claim in respect of obstruction of light, he thought that, if the Court had a discretion, this was a case for awarding damages in lieu of an injunction; but he doubted whether this was not precluded by the decision in *Shelfer v. City of London Electric Light Company*.

By the majority of the Court, therefore, the appeal was dismissed.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, May 5.

(*Before Lords Justices* A. L. Smith, Vaughan Williams, *and* Romer.)

Mayor, &c., of Liverpool v. Assessment Committee of the Llanfyllin Union and Others.

This was an appeal from the decision of the Divisional Court (Mr. Justice Ridley and Mr. Justice Phillimore) upon a case stated by the Quarter Sessions for the County of Montgomery on an appeal from the Assessment Committee of the Llanfyllin Union with regard to the rating of Lake Vyrnwy and other parts of the Liverpool Water-Works situated within the parish of Llanwddyn.* The property of the Corporation within Llanwddyn and other parishes in the county consists of a reservoir (Lake Vyrnwy) with banks, dam, and appurtenances, the greater part of which is within the parish, and of part of the land occupied by the Hirnant tunnel and its appurtenances. The gross rental is £19,500, and the rateable value £15,322. The land was acquired, and the works were constructed, under the provisions of the Liverpool Water-Works Act, 1880; and they are, by virtue of section 9, to form part of the system of works constructed by the Corporation under their Water-Works Acts for the supply of water to the city of Liverpool as if they had been authorized by such Acts. They are occupied solely for this purpose, and so long as the premises and works remain part of the system of water supply, the Corporation are the only possible tenants; but the reservoir and dam are physically severable from the other works. On Dec. 1, 1896, the Corporation were rated by the Assessment Committee in respect of the reservoir and works, upon a net assessment of £15,322, in the sum of £542 13s. 1d., being a rate of 8½d. in the pound. The Corporation appealed to Quarter Sessions. The cost of constructing the reservoir and works was £646,932; and the cost of the land upon which they stand, £62,250—making £709,182 for the reservoir and site. In addition to this expenditure, the Corporation were bound by their Act to make certain roads and bridges and erect a church, vicarage, and schools. The latter were in substitution for buildings submerged by the formation of the reservoir. They spent on roads £55,939; on bridges, £8337; and on the church, vicarage, and schools, £13,952. None of these hereditaments are in the occupation of the Corporation. The reservoir is now capable of delivering 52½ million gallons per day, though the catchment area which is at present connected with it is only sufficient to provide 41 million gallons; but catchment areas capable of providing the remaining 11½ million gallons will ultimately be connected. Of the 52½ million gallons, 39 millions will be delivered by means of three pipes at Liverpool, and the remaining 13½ millions will be passed down the River Vyrnwy as compensation water, in accordance with the provisions of the Act of 1880. At present only one of the lines of pipes, capable of carrying 13 million gallons a day, has been laid. The Corporation are able to borrow money at £2 10s. 11d. to £2 11s. 10d. per cent.; but the money for the Vyrnwy Water-Works has been raised, part at 3½ per cent., and the remainder at 2¾ per cent. The Corporation estimate of the rateable value of the property was as follows: They took the total cost of the reservoir and site to be £709,182, and the cost of the portion within the parish of Llanwddyn as £617,450. As only 26½ million gallons—*i.e.*, 13 million gallons for Liverpool, and 13½ million gallons compensation water—are now being produced, instead of the ultimate quantity of 52½ million gallons, they reduced this figure by half; making £308,725 as the total effective value of the reservoir and site. The total cost of the Hirnant tunnel and appurtenances within the parish they took at £27,936. They divided this latter figure by three, as only one of the three pipes was being used; making the total effective cost £9312. This made the present effective capital value of the works in the parish £318,037. They put the rateable value at £8746; being 2¾ per cent. of the effective capital value. The Assessment Committee, in their estimate, added to the value of the site of the lake the improved value due to the construction of the roads and bridges by the Corporation, which amounted to £70,091; and they estimated the total capital value of the reservoir and works as improved at £818,615. They multiplied this by the fraction 27-41, to obtain the present effective capital value; making £539,088, of which £474,574 was apportioned to the parish of Llanwddyn. The fraction 27-41 was used because, though 52½ million gallons is the capacity of the reservoir, yet the catchment areas now connected with it only produce 41 millions. The cost of the tunnel divided by three was estimated at £9280; making the present capital value of the reservoir and tunnel in the parish of Llanwddyn £483,854. The total capital value of the whole of the water-works undertaking was estimated at £3,880,733; and the gross rental value at £184,163, which was equal to 4¾ per cent. on the total capital value. The gross rental value, calculated at 4¾ per cent. on £483,854, yielded £22,983, less rates, at 2s. 2d. in the pound on a rateable value of £16,920, amounting to £1833; making the gross rental value of the land, lake, works, &c., in the parish £21,150. Taking 20 per cent. for maintenance and renewal, the rateable value of the land, lake, works, &c., in the parish was brought to £16,920. The Quarter Sessions held that, in order to ascertain the effective capital value of the undertaking, the sums expended, not only on the roads and bridges, but also on the church, vicarage, and schools, ought to be included—making the total capital cost of the reservoir and site £787,410; that the effective capital value of the reservoir and site ought to be taken at 26½-41 of the expenditure—namely, £508,935; and that £9312 should be added to that, being one-third of the cost of the tunnel—making the total effective capital cost £518,247. They were further of opinion that, in consequence of the greater demand at the present time for such sites, and of the increased cost of labour and materials, the outlay would be greater than the actual cost of the site and works of the Corporation, in consideration of which the rateable value should be taken at 3 per cent. on the outlay, rather than 2½ per cent., the rate at which the appellants could borrow; and, finally, that if, in law, the reservoir and dam might be rated separately, and not as integral parts of the appellants' water undertaking, their annual value, if let as a separate hereditament, should be arrived at by an estimate based upon 3 per cent. of the capital expenditure properly attributable thereto. The questions for the Court were: (1) Whether the reservoir and works were to be treated as integral parts of the water-works undertaking, or as severable from the rest of the undertaking; (2) whether the Quarter Sessions were right in taking into account the circumstances of the greater demand for sites, &c., in addition to the rate of interest at which the appellants could have borrowed money at the date of the making of the rate; (3) whether, in order to ascertain the effective capital value of the undertaking, the amounts expended upon roads, bridges, church, vicarage, and schools ought to be included; (4) whether the effective capital value of the reservoir and site ought to be taken at 26½-41, or at 26½-52½ of the total capital expenditure thereon; (5) whether the rateable value of the undertaking ought to be taken at 3 per cent. or 2½ per cent. on the effective capital value. The Divisional Court affirmed the decision of Quarter Sessions except upon questions (3) and (4), as to which they held that the amount expended upon the roads, bridges, church, &c., ought not to be included in ascertaining the effective capital value of the undertaking; and that the effective capital value of the reservoir and site ought to be taken at 26½-52½ of the total capital expenditure. Upon these two points they reversed the decision of Quarter Sessions. The Assessment Committee appealed.

Mr. Marshall, Q.C., and Mr. Ellis J. Griffith appeared for the Committee; Mr. E. Honoratus Lloyd (with whom was Mr. Balfour Browne, Q.C.) represented the Corporation of Liverpool.

Lord Justice A. L. Smith said that it was not denied that the reservoir and other works were rateable. The only question was as to the amount. The Queen's Bench Division, by answers which they gave to two questions, had cut down the rate. The Assessment Committee appealed to this Court. It appeared that the effect of the works executed by the Corporation was to put a large tract of land under water by damming up a stream flowing through a valley—submerging, among other things, a church, a vicarage, and schools. By the Liverpool Water-Works Act, 1880, the Corporation were bound to build another church, vicarage, and schools upon a fresh site. Now it was familiar law that, if the hereditament proposed to be assessed was comparable with other similar hereditaments, evidence could easily be called to show the rent which a hypothetical tenant from year to year would be willing to pay for the hereditament. A difficulty had sprung up in rating law. Certain hereditaments were not comparable with other hereditaments. Some of these yielded a profit, and some did not; but they did not escape liability to being rated because there was no hereditament to compare them with. Dealing only with the case of hereditaments that yielded no profits, one way of arriving at the rent which a tenant from year to year, including

* See "Journal," Vol. LXXII., p. 160.

the occupying owner as a possible tenant, would pay for the hereditament was by ascertaining the cost of the land and works. He agreed that the interest on the money spent on the land and works was not to be taken as the actual rent which a hypothetical tenant would pay; but it could be adduced in evidence as some criterion of what a tenant would give. The present being a reservoir as to which no comparison could be made, both parties agreed that the only mode of arriving at the rent which a tenant would pay was to ascertain the capital value of the money spent on the reservoir. The amount laid out on the land and works was not disputed. It was said, however, that the expenditure of the Corporation upon the church, vicarage, and schools, and upon certain roads and bridges, should not be included. The Divisional Court upheld this contention. Was there anything wrong in law in taking those items of expenditure into account? He could see nothing wrong in so doing. The Corporation could not have got the reservoir as it was without paying the money for building the church, vicarage, and schools. Why was not this a proper expenditure to take into account in arriving at the rateable value? A percentage on the cost was not necessarily the rateable value; but the cost was a criterion for arriving at the rateable value. The Quarter Sessions took this expenditure into account; and he could not say, as a matter of law, that it was not right to do so. So also with regard to the roads and bridges, he could not say, as a matter of law, that the Quarter Sessions ought not to have taken this expenditure into account. As to the second point, he could not understand why any divisor was brought in at all. According to the decision in *Regina v. South Staffordshire Water-Works Company*, he did not see why anything should be taken off the cost of the reservoir. But the Assessment Committee were willing to make some deduction. What right had the Divisional Court, as a matter of law, to say that 26½—52½ was the right amount, and not 26½—41, as allowed by the Quarter Sessions? It was a question of fact for the Quarter Sessions. The appeal must therefore be allowed, with costs in that Court and the one below.

Lords Justices VAUGHAN WILLIAMS and ROMER delivered judgment to the same effect.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, May 18.

(*Before Mr. Justice* BUCKNILL.)

Crays Gas Company v. Bromley Gas Consumers' Company.

The proceedings in this case, which were opened on the 1st inst. (see *ante*, p. 1224) were resumed this morning. The plaintiffs claimed a declaration that a certain agreement made between them and the defendant Company was binding on the latter, and an injunction to restrain them from selling and supplying gas in any part of the parishes of Orpington and Farnborough other than that lying to the west of Lock's Bottom, Bromley Common.

Mr. LITTLER, Q.C., Mr. R. M. BRAY, Q.C., and Mr. CLARKE WILLIAMS appeared for the plaintiffs; Mr. CRIPPS, Q.C., M.P., Mr. DANCKWERTS, and Mr. VAUGHAN WILLIAMS represented the defendants.

Mr. *William May* was recalled, and gave further evidence as to meetings which took place in 1865 between the Directors of the two Companies, at one of which—viz., that held on April 22—the agreement was settled, and signed by himself and Mr. Robinson Latter. In his experience, when a Bill was in Parliament, it was usual for such agreements to be made by the solicitors to the parties.

Mr. CRIPPS objected to this evidence; and a discussion ensued upon it.

Justice BUCKNILL said the witness had better at present confine himself to his own authority.

Witness said he had authority from his own clients; and he assumed that Mr. Latter had also, or he should not have negotiated with him.

Mr. CLARKE WILLIAMS having stated the dates on which Mr. Latter, Mr. Osborn (the former Secretary of plaintiff Company), and other gentlemen whose names appeared in the letters, died,

Mr. *May*, in cross-examination by Mr. CRIPPS, said that on the 22nd of April, 1865, Messrs. Stanger and Francis and himself attended the meeting on behalf of plaintiff Company. It was held at Messrs. Latter's office. Mr. Latter and one or two of the Bromley Directors were present. He did not recollect whether or not Mr. Wild was there. The agreement was then settled. It was drawn up at the meeting, and carried out what Mr. Latter and he had already agreed upon. He thought that was the only agreement in writing in 1865. He did not recollect whether or not there was a duplicate written at the time, or what became of the agreement. He thought Mr. Latter dictated it and he wrote it. According to the parliamentary boundaries of the two Companies, Chislehurst, Orpington, and Farnborough parishes were common ground. [The witness marked on an Ordnance map what he said was the agreed northern boundary.] According to his view, there was at one point about half-a-mile which neither Company were to supply; but there were no consumers there then. At another point there was a gap of about three-quarters of a mile; but this was a common. Nothing was said about the duration of the agreement. In 1865 there was no immediate expectation of supplying gas at Farnborough. In 1884 there was a discussion between the two Companies as to an alteration of their limits. At that time the plaintiff Company were seeking to extend their supply to Farnborough for the workhouse. The discussion then arose because the old agreement could not be found. He and Mr. Latter knew what the agreement had been, and came to an arrangement on the same basis. He did not recollect an interview with Mr. Robinson Latter in 1890 regarding the boundaries.

Re-examined: He was perfectly clear that in 1865 there was an agreement in writing which defined the whole of the boundaries. It was in reliance on that agreement that he allowed the Bromley Company's Bill of 1865 to pass. There had never been any difference between himself and the late Mr. Latter on the subject. He believed the fact of there being two Bills pending was recited in the agreement. There was no foundation for the suggestion that any discussion or agreement referred to Chislehurst only. The negotiation arose out of an attempted invasion by a Company called the Kent Gas Consumers' Company, which they both opposed.

Mr. *R. Behrens*, J.P., said he was a Director of the Crays Gas Company in 1865, when application was made to Parliament for a Bill. He recollected an agreement being made between the two Companies, limiting their respective districts. This agreement referred to several parishes; it was not confined to Chislehurst. The boundaries were at Farnborough, Paul's Cray Common, and Perry Street. The Farnborough Union was in the plaintiffs' district. He never saw the written agreement.

Cross-examined: He could not say whether the agreement was in writing, and there was no minute of its contents. He gave the boundaries agreed upon according to his recollection. He had stated in an affidavit on the motion for injunction that the watershed between the Ravensbourne and the Cray was the agreed boundary. He had heard Mr. May refer to the watershed. He did not know that the workhouse was on the Bromley side of the watershed, and that in consequence of this being discovered the boundary was altered.

Re-examined: There was a ridge on the Crays side of the Plough Inn, Bromley, and he took that ridge as the watershed.

Mr. *Preston Davies* said his late father, Mr. Preston Davies, was a draughtsman, and skilled in referencing; and he made a map showing the districts of all the London and Suburban Gas Companies. He took great care in obtaining the information upon which he prepared his map. Witness produced an account-book in his father's handwriting which contained an entry relating to the Bromley Gas Company.

A discussion ensued as to the admissibility of the book in evidence; the object being to show that the defendants had had a copy of the map in question. In the result, the evidence was rejected.

This concluded the plaintiffs' case. In the absence of Mr. Cripps,

Mr. DANCKWERTS said he proposed to call his witnesses at once.

Justice BUCKNILL suggested that the parties might even now come to some arrangement.

Mr. DANCKWERTS said every effort had been made to do so, but in vain.

Mr. *S. J. Wilde*, a Director of the defendant Company, was then called. He said he was a Director several years before the Act of 1865 was obtained. He drafted the Bill, and knew section 48 of the Act. At that time he lived at Bromley, and often saw Mr. Robinson Latter, who also resided there. In the same session there were Bills pending by the Crays and Eltham Companies. The Crystal Palace Gas Company had their Act. There was another Company, called the Kent Gas Consumers Company, who did not get theirs. The Crystal Palace Gas Company had a portion of their district which was of little use to them; they were willing to give it up to the Bromley Company. An agreement to this effect was made in writing in 1863. In 1866 an agreement was entered into with the Eltham Company. While the Bills were passing through Parliament, there were, no doubt, discussions with the plaintiff Company; but he could not recollect them. He was positive no written agreement was made with the Company about boundaries in Orpington or Farnborough. He was pretty certain there was no verbal agreement; but there was a verbal agreement with regard to Chislehurst. He recollected a meeting in the Board-room at Bromley, at which Mr. Francis and one or two other gentlemen were present; but he could not remember if Mr. May was there. He could not say when it was; but it was the only one at which any representatives of the plaintiff Company were present. A discussion took place about the boundaries; but no agreement was arrived at. He was well acquainted with Mr. Latter, and regularly attended the Board meetings of the Company. After Mr. Henry Latter joined the Board, he several times suggested that the mains should be extended in the direction of Farnborough, where he resided.

Cross-examined: He had a high opinion of Mr. Latter's businesslike habits. Nevertheless it was not correct that there was an agreement under seal, although the Secretary in 1890 wrote that he had been told so by the Chairman. He knew the plaintiff Company petitioned against the Bromley Company's Bill in 1865; but he had no recollection of how the petition came to be withdrawn. The defendant Company had never, until the present dispute arose, gone into the districts Mr. May said were within the agreement, because it would not have paid them to do so.

Mr. *William Woodward*, Engineer and Manager to the defendant Company, spoke to an interview in October, 1890, with the late Mr. Edwards, then Secretary to the plaintiff Company, with regard to the public lighting of Chislehurst, and whether the Bromley Company could light the whole of it. Mr. Edwards suggested that there was an understanding between the Companies; and he asked witness to see Mr. Latter about it. He afterwards wrote to Mr. Edwards saying the Chairman said there was a proper agreement between them about it, and asking him to look for it. [This correspondence was read; and it appeared therefrom that the agreement could not be found.] He had had conversation with Mr. Edwards about Orpington and Farnborough; and he remarked jocularly that he had been smarter than the Bromley Company in taking possession of the field. He recollected an interview in the summer-house of Mr. Latter's residence in December, 1890, at which Mr. May, Mr. Edwards, Mr. Latter, and witness were present. They discussed the Perry Street mains; and Mr. Edwards suggested that they should have a scheme for the whole district. Mr. Latter said this would be for those who came after him; and he would not go into it. Witness afterwards submitted to Mr. Edwards a plan dealing with the Chislehurst boundary only. Mr. Edwards died before any agreement was come to.

Cross-examined: He became Engineer to the Company in 1890, and knew nothing of what had taken place before. He knew Mr. Preston Davies's map; but he had already repudiated it when the letter was sent suggesting that the limits therein defined should be accepted on both sides. He knew Mr. Edwards suggested that the map was founded on information supplied by both Companies. He (witness) was sure his Company had not paid £4 4s. to Mr. Davies for one of his maps. He had not looked at the accounts. There was, he believed, correspondence between his Company and Mr. Davies in 1888. [Some of this correspondence was read, in which Mr. Davies said he would call and see the Bromley Company's Engineer, with a view to defining their boundaries, and also referring to "the finally settled boundaries."] The Company ordered a map, but never received it, and did not pay for it.

Re-examined: He remembered Mr. Davies calling and submitting the map. He (witness) did not purchase it because it was incorrect, as he told Mr. Davies.

Mr. CRIPPS said he should put in the map, in order to avoid any question hereafter.

Mr. *Wilde*, recalled, said he recollected the map being submitted to the Board; but as the Company's officials said it was incorrect, it was not purchased.

Mr. *H. W. Amos*, the Secretary to the Bromley Gas Company since 1890, was next called. He said that previously he was Chief Clerk in the office, and had never heard of any agreement in writing between the two Companies. He entered the Company's service in 1863. He had searched, but found no trace of such a document beyond what had been disclosed. He never heard of any agreement being come to in 1884.

Cross-examined: There was no entry in the Company's minute-book relating to the Act of 1865, except one statement by the Chairman that the petition had been sealed. He was not aware of any case in which a gas company had laid mains in a portion of the district within their parliamentary limits which was already supplied by another company.

Mr. *Alexander Dickson*, Chairman of the Bromley Company since the death of Mr. Latter, and a Director since 1890, was the next witness. He spoke to interviews with Mr. May, in 1897. No reference was made to a written agreement having been signed in 1865. There were subsequent interviews between himself and the Deputy-Chairman on the one hand, and Mr. May and one of the plaintiffs' Directors on the other; but it was understood that, unless an arrangement were come to, nothing should be said as to what passed.

Witness was shortly cross-examined on some of the correspondence, which he said was not in his mind when this dispute first arose.

Mr. *W. Whitaker*, F.R.S., F.G.S., said he had made a survey of the district in question, and recently went over the ground, and marked on a map the boundary of the watershed between the Ravensbourne and the Cray. The workhouse at Farnborough was well on the Ravensbourne side. [The map was put in.]

Cross-examined: It was not easy for an uninstructed person to define the watershed of the district.

This concluded the evidence; and the further hearing was again adjourned until after the Whitsun Vacation—his Lordship remarking that it was a great pity old friends and neighbours could not come to an arrangement.

The Winding Up of the Patent Gas Enrichment Syndicate.

Meetings of creditors and shareholders in the above-named Company (now in liquidation) were held at the offices of the Board of Trade, Carey Street, Lincoln's Inn Fields, last Thursday, when the Official Receiver (Mr. S. Wheeler) made his report. He stated that the Company was registered in December, 1897, with a nominal capital of £20,000, in £10 shares, to carry on the business of gas enrichment spirit manufacture under a patent process. The promoter was Mr. Thomas Fenwick, of 63 & 64, New Broad Street, E.C.; and Miss Curtis, a clerk to that gentleman, had acted as Secretary throughout the existence of the Company. Under an agreement, dated Dec. 14, 1897, Mr. Fenwick agreed (1) to pay the expenses of the promotion of the Company and of issuing the capital, (2) to assign to the Company the patent No. 2515 of 1897, granted to Herbert John Dawes, and stated to be for gas enrichment spirit and plant in connection therewith, and (3) to erect an installation of plant with a minimum capacity sufficient for the purpose of starting the business. The consideration to be paid to Mr. Fenwick for these services was fixed at £35,000, payable in cash, debentures, and shares. It appeared that the patent in question was granted to Mr. Dawes on Nov. 27, 1897, for improvements relating to an apparatus for the distillation and breaking up of liquid hydrocarbons, and similar substances, and did not relate to the process for the manufacture of gas-enrichment spirit. He (the Official Receiver) was further informed that the apparatus comprised by the invention had never been made. In February, 1898, Mr. Dawes agreed to sell the patent to the Company for £50 cash and £100 in shares, on the promise of employment at £3 per week. The first prospectus was prepared by Mr. Fenwick, approved by the Directors, and issued on Dec. 14, 1897. It offered 2000 £10 shares, and also 2000 £10 debentures, constituting a first charge on the whole of the assets of the Company, and bearing 5 per cent. interest. The prospectus stated that the Company was formed to acquire the valuable patent right and special process for the manufacture of "Richolene"—a superior gas-enriching spirit; also that the estimated annual profit was £7395. In response to this prospectus, applications were received for 10 shares, which the Directors proceeded to allot on Dec. 21, 1897. A second prospectus was issued in January, 1898; and in the following May a third was sent out. The latter contained a statement that considerable progress had already been made with the works, which was untrue. The Company received applications for, and duly allotted, 158 shares and 32 debentures, in respect of which £1677 10s. was paid in cash. Mr. Dawes had stated that no payment whatever had been made to him in respect of the purchase of his patent rights, which he had consequently never assigned to the Company or to Mr. Fenwick. It appeared that although various payments had been made and debentures issued to Mr. Fenwick under the purchase contract, he had never been in a position to assign the patent to the Company, and had not fulfilled his agreement to erect an installation of plant on a plot of land leased by the Company at Belvedere, except by having set up two second-hand iron sheds of no use whatever for the erection of plant or machinery. The Company commenced proceedings in October, 1898, against a share applicant to enforce payment of calls. This action was defended on the ground that the applicant had been induced to apply for the shares by false and fraudulent representations and concealment of material facts in the prospectus. The Court directed the Company to remove the name from the register of members, and to repay the £25 that had been paid in respect of the shares. The Company was controlled throughout by Mr. Fenwick, who received £1445 out of the £1694 paid into the Company's banking account. In the opinion of the Official Receiver, the Company was promoted by Mr. Fenwick solely for his own benefit, and not with any *bonâ fide* intention of carrying out the object for which it purported to be formed. There was no independent Board of Directors they having apparently acted under the directions of Mr. Fenwick, and not in the interests of the shareholders, especially in going to allotment on a totally inadequate subscription, and in paying to that gentleman practically the whole of the amount subscribed. He was bound to think that the failure of the Company was entirely due to these facts, and to Mr. Fenwick's omission to carry out his agreement to assign the patent to the Company, and to erect plant and machinery for its use. These matters would be reported to the Court, and an application would be made for a public inquiry into the whole case, which appeared to be saturated with fraud. There were no assets of any value to meet the claims on the debentures, as there was £60 due for rent, and the sheds would probably not fetch 5s. This was not the first occasion upon which he had made the acquaintance of Mr. Fenwick under similar circumstances; and it would be his duty to lay the facts before the Public Prosecutor. A resolution was passed for the winding-up proceedings to be left in the hands of the Official Receiver. We learn from the "Financial News," from which the foregoing particulars have been taken, that Mr. Fenwick was invited to address the meeting of shareholders; but he declined to make any statement.

Under the heading of "Strong Words at Carey Street," the "Pall Mall Gazette" last Friday commented upon the above matter as follows: "We have had occasion ere this to criticize unfavourably the schemes propounded by Mr. Thomas Fenwick. . . . Yesterday, Mr. Wheeler, as Official Receiver, had before him the matter of the liquidation of the Patent Gas Enrichment Syndicate—a concern criticized in hostile fashion, as it deserved, at the time of its inception. The Official Receiver was extremely strong in some of the remarks made by him in regard to this promotion. In his opinion, he stated, the Company was promoted by Mr. Fenwick solely for his own benefit, and not with any *bonâ fide* intention to carry out the object for which it purported to be formed. He proceeded to advance certain contentions in justification of this conclusion, and stated that the facts would be reported to the Court, and that an application would be made for a public inquiry. So that we may probably hear more of the matter before long."

Damages Against a Director of the Meteor Incandescent Lighting Company.

In the Queen's Bench Division last Friday, Mr. Justice Bruce delivered judgment in the case of *Forrester v. Bateman*, which was an action to recover damages for alleged fraudulent representations. Plaintiff said he was induced to take 100 shares in the Meteor Incandescent Lighting Company on the representation of the defendant, who was a Director, that the Company was in a sound condition. He further said the defendant fraudulently concealed from him the fact that an action was pending in which the validity of the patents which the Company was formed to work was impugned. The Company was registered in October, 1895, with a nominal capital of £140,000, to work certain incandescent patents, and defendant was appointed one of the first Directors. Plaintiff alleged that in February and March, 1896, he met the defendant, who represented that the concern was a sound one, and that it was absolutely certain to return a good profit in a short space of time. Defendant admitted informing the plaintiff that he thought the Company was a good thing, and would make a profit in a short time. He, however, denied that he knew at the time that the patents were impugned. The liabilities of the Company in March and April, 1896, exceeded the available assets; and it was impossible to avoid the conclusion that the defendant must have known, on March 20, that the Company was pressed for money. The action of the Welsbach Incandescent Company against the Meteor Company was successful; and the plaintiff said that if he had been told that the validity of the patents was in question, he would not have invested his money. His Lordship said he was of opinion that the plaintiff was entitled to succeed; and therefore he gave judgment for him, and assessed the damages at £100.

Fraudulent Consumption of Gas.

At the Barry Police Court, a few days ago, William Kerslake, residing at 55, Bell Street, Barry, was summoned for fraudulently obtaining gas belonging to the Barry District Council. Mr. J. A. Hughes, who appeared for the prosecution, said defendant had a prepayment meter for supplying his house, and one of the collectors, calling there a little earlier than usual, found that the meter had been removed, and a pipe so placed that gas passed to the burner without being registered. Defendant had since written to the Manager of the gas-works (Mr. F. M. Harris), and also to the District Council, admitting the offence, but adding that he had been guilty of it because he had no money in the house, and his wife was ill at the time. He had only recently got employment. The Council, under the circumstances did not press for a heavy penalty. Defendant was fined 5s., including costs.

Cutting Off Domestic Water Supplies at Newcastle.—The Newcastle Corporation are promoting in Parliament a Bill in which is a clause requiring the Newcastle and Gateshead Water Company to give notice to the Corporation within four days of the water supply to any private house being cut off, or in default to be liable to a penalty of £10. The Company took exception to this; and the Sanitary Committee of the Corporation, in order to avoid friction, have made an alteration to the effect that notice be given within seven days, or in default a nominal fine of 20s. be inflicted.

Bolton Corporation Water Supply.—At a recent meeting of the Water Committee of the Bolton Corporation, the balance-sheet for the past financial year was under consideration. It showed that the total income was £62,631, an advance of more than £2000 on the preceding twelve months' operations. The supplies for domestic services produced £37,617; and trade supplies, £17,602. The expenditure for the year aggregated £45,481—a decrease as compared with the previous twelve months. Of this sum, £2510 was absorbed in salaries, and £5933 in the maintenance of works. The Committee resolved that £2149, a portion of the credit balance, should be carried to the renewal fund account, and that £15,000, the remainder, should be transferred to the borough fund in aid of the rates. Last year £1000 was placed to the renewal fund account, and £13,848 handed over in relief of rates.

MISCELLANEOUS NEWS.

BIRMINGHAM CORPORATION GAS AND WATER UNDERTAKINGS.

Steady Development of the Gas Business—The Saltley Extensions—The Augmented Cost of the Contracts for the Elan Valley Water-Works.

The Annual Reports of the Birmingham Corporation Gas and Water Committees, which were noticed in last Tuesday's issue, were presented at the meeting of the Council the same day.

Mr. J. H. Lloyd, in submitting the report of the Gas Committee, proposed that they be authorized to appropriate £30,320, the net profit for the year, to the credit of the improvement rate for 1899. The accounts showed that the financial position of the department was as follows: Capital, £2,360,347; profits, including interest, £131,984, of which £75,924 was required to pay the debenture interest and annuities, and £25,740 was needed to provide the statutory instalment of £4217 and the interest on the accumulated fund—leaving £30,320 available profit. This compared with £50,336 last year; and at first sight the comparison might be deemed unfavourable. It must, however, be remembered that a year ago the Council decided to decrease the price of gas by 1d. per 1000 cubic feet; and it was also decided for the first time to reduce the rate for accounts exceeding 250,000 cubic feet per quarter by an additional 2d. per 1000 cubic feet—making the lowest price 2s., less 5 per cent. This reduction was calculated to cost £30,000 a year; but as it took effect only from June 30, £25,000 was the estimated reduction for the nine months. The result had shown that the estimate had been somewhat exceeded, owing to the sale at the lower prices having been greater than was anticipated, and the actual reduction had been £27,035. As the profit was only £20,000 less, it followed that the working of the business had saved the additional £7000. The course adopted last year had therefore clearly been justified; and the accounts disclosed a very satisfactory year's working, inasmuch as they were able to pay the £30,000 in aid of the rates, after benefiting the consumers to the extent of £27,000. The details of the revenue account showed that the sales had amounted to 5201 millions—an increase of 2¼ per cent.; and they had produced £543,850—£11,839 less than last year, on account of the reduction in the selling prices. Notwithstanding the absence of fog and frost, and the decline in the cycle trade, which added so much to the demand the previous year, there was an increase in the consumption in every class. The cost of manufacture had been £448,197, against £431,903—an increase of £16,294, due partly to the increased consumption and partly to the higher price of coal and oil. Residuals had realized more by £18,182, of which £11,500 was in respect to coke, which had risen in price. Ammoniacal liquor realized £8218 more, owing to the increased value of sulphate; but the amount for tar had been £1536 less, though this should increase again this year. Residuals generally were realizing better prices because of the improved state of trade and the reduced output by the introduction of carburetted water gas. If they worked up to the present authorized limited output of 25 per cent. of carburetted water gas, they would carbonize 120,000 to 150,000 tons less coal than would be required if they made all coal gas. This would represent a diminished make of about 20,000 tons of coke for sale, 6000 tons less tar, and something like three-and-a-half million gallons less ammoniacal liquor a year. When similar withdrawals from the market in other large undertakings were taken into consideration, it was obvious that, with even moderately good general trade, they might look forward to maintaining their present income from residuals, and might, perhaps, hope for something better. Coal had cost £15,000 more, and showed a tendency to rise still higher. In the cost of distribution, there had been an increase of £6000 for the repairs of mains, the law and parliamentary charges had increased by £300, and the superannuation scheme had cost £1400 more. The extensions at Saltley had made progress; and the cost had, in consequence, been increased by £24,341. The extension of mains in the suburbs had augmented the item of new mains by £5713. The Committee had now 606 miles of mains; and in addition to the new mains 2½ miles had been relaid with larger sizes. The year might be described as one of steady development. The quantity of gas sold was greater than in any previous year; and the average net price of the gas to consumers—viz., 2s. 1·09d.—was lower than in any previous year, with the exception of 1886, when the price was one-twentieth of a penny less, at a time when coal was much cheaper, when residuals realized a higher price, and before the great increases in wages and in railway rates, and when the contributions to the city fund were less, both directly and indirectly.

The resolution, having been seconded, was put to the vote and carried.

Mr. Lloyd then moved the adoption of the report. He remarked that a letter had been received from Messrs. Barnsley and Sons asking that the reason they withdrew their tender for the erection of the new retort-house at Nechells should be explained to the Council. The reason was contained in a letter written on behalf of the Committee to Messrs. Barnsley and Sons, intimating that they could not accede to the request that a weather clause should be inserted in the contract, nor to the bills of quantities being incorporated in the document.

Mr. Stembridge, referring to the withdrawal of Messrs. Barnsley's tender, remarked that he could not understand why the Committee declined to assent to the request of the Contractors. With regard to the arrangements made with Messrs. Aird and Sons, he did not suppose any firm of builders could be found in London or Birmingham who would not be delighted to do the work on the same terms.

Mr. Lloyd, in reply, said that Messrs. Barnsley tendered for the work; and as they were the lowest the contract was offered them. Then they wanted conditions inserted which the Committee and the Town Clerk did not feel justified in granting; and consequently Messrs. Barnsley and Sons withdrew.

Mr. Marsh declared that a profit of £30,000 on a capital of two-and-a-quarter millions was paltry.

The resolution was carried.

Alderman Lawley Parker presented the report of the Water Committee; and, in moving its adoption, alluded to the revenue account, remarking that on the income side the chief feature was the fact that water-rents had increased by £9665, as compared with the previous year. The profit was £18,596 more than the amount foretold in the parliamentary forecast; and it exceeded the estimate of profit in the parliamentary forecast of three years in advance—viz., 1902. The increase this year was 4·56 per cent., as against 6·1 per cent. in the previous year; but it compared favourably with the forecast of 3 per cent. annually—being 1·56 per cent. better than the estimate. This was not all due to natural increase, but partly to the change of method of charging. The cost of pumping had increased; the chief explanation being that more water had been pumped, and they had had to pay more for coal. Until the Welsh water arrived, there would be a steady increase in the pumping; and it was satisfactory to know that, when the water was received from Wales, the pumping would be reduced to very small proportions. Turning to the profit and loss account, he said the profit was £13,246 less than in the previous year; but the interest on the new capital expended, and sinking-fund charges on the old capital, had exceeded the difference of profit between the two years by £1500, and entirely accounted for the reduced profit now. The forecast estimated a loss of £8000 during the past year; so that, having made a substantial profit instead of a loss, there was a difference of £23,000 to the good as compared with what was foretold. The finances of the department generally were satisfactory, though the Committee had had many drawbacks to contend with. The consumption of water had increased during the year; and the increase was explained by the fact that the estimated population was 23,000 more than in the previous year, and by the abnormal consumption during a period of drought. Dealing with the Elan supply, Alderman Parker pointed out that the rainfall for the last six months on its watershed was from 24½ to 28 inches., while at the Whitacre station for the same period it was 6⅓ inches. They had now pierced all the important tunnels; and the work had come out accurately in every case within an inch. All the contracts for the aqueduct had now been let. He had recently had to inform the Council of several large contracts that had come out greatly in excess of the parliamentary estimate. This had been the common experience latterly of all bodies who had required building work of any kind. The Council had had a large experience during the past six months of very great increases in actual cost over estimates. Therefore it was not to be wondered at that estimates made for parliamentary purposes in 1891 and 1892 should be considerably exceeded at the present time. During the last five years at least, there had been a continuous upward movement in everything connected with building. There had been a great advance in materials—especially in iron and steel—in cement, and in bricks; there had been also substantial advances in wages. Then in consequence of the active state of trade, they had found it by no means easy to get contractors to tender at all for the latter part of the work; all the great firms being busy with railway, dock, and harbour contracts. The difficulty, perhaps, was partly due to the fact that the Corporation required exceptionally good work. In one instance they had only one tender; and the Committee seriously thought it would be necessary to do that section of the aqueduct themselves by administration. The tender, however, was a reasonable one; and the contractor having made some concessions, the Committee decided that it would be more economical to let him do it than to do it themselves, especially as they would have to buy a large plant which would be of comparatively little value to them afterwards. It was said that the minimum standard rate of wages clause in their tender forms, and, during the last twelve months, the Workmen's Compensation Act, had helped to raise the prices quoted by contractors. Reviewing the figures of the various contracts as compared with the parliamentary estimates, Alderman Parker said that the first, let in 1894, was only 2·13 per cent. in excess. The second contract, let two years later, was 18·74 per cent. in excess. Speaking generally, the contracts that had most exceeded the parliamentary estimate were those in which there were the largest quantities of iron and steel. The first contract in which pipe-lines were included was only 5 per cent. in excess; the second, about 25 per cent.; and the next, which was all pipe-line, 28·53 per cent. The fourth contract, which was let in 1898, was 48·35 per cent. in excess; and the fifth, also let in 1898, 45·37 per cent. Unfortunately, these were two of the largest contracts. Then they had a small contract this year which was a little less than 10 per cent. over the parliamentary estimate; but only about one-tenth of that was pipe-line. The excess in the contracts for the aqueducts amounted in all to £463,654, or about 28 per cent. above the parliamentary estimate. It was difficult to compare the cost of the Frankley works with the parliamentary estimate, because the details had been altered; but the contract was 4·13 per cent. in excess, and something would have to be added for certain things that would be required subsequently. To sum up, the whole of the contracts, including the items he had added to the Frankley works, showed an excess of £500,000 over the parliamentary estimates. He should prefer to call it £550,000, because it was certain that there would be some extras on the present contracts, though the Committee believed that these would be exceedingly small; the Engineers having so arranged the contracts that it was impossible to have any but *bonâ-fide* extras.

Mr. Lancaster: Will the Chairman of the Committee tell us what the gross amount of the contracts is to-day?

Alderman Lawley Parker replied that the gross amount of the contracts for aqueducts was £2,085,574, and of those for the Frankley works £314,428, or £2,400,000 in all, as compared with the parliamentary estimate of £1,923,000—giving a difference of £476,000. Adding to this what he thought would be the expenditure on engines and filter-pans at Frankley, he made the difference £500,000. It was fair to remind the Council that he had already told them that the works the Committee were doing themselves in the Elan Valley would certainly exceed the parliamentary estimate by a considerable sum. The increase in the cost of materials and wages affected the Elan Valley works, as it had the contracts; and, in addition, they had had difficulty in finding suitable stone on the spot and in getting good foundations for the dams. He was afraid also, though he did not think so at first, that there might be an increase on the whole as far as the land was concerned. There certainly would be an increase in the proportion of the land that was placed in the estimates that were submitted to the Council in 1891 for the first instalment of the scheme. Only half the watershed was placed in that estimate as being chargeable to the first instalment; but the Act of Parliament required all the purchases on the watershed to be completed within ten years, or, rather, that was the period within which the land could be acquired compulsorily. Although they had received from those

Mr. *Wilde*, recalled, said he recollected the map being submitted to the Board; but as the Company's officials said it was incorrect, it was not purchased.

Mr. *H. W. Amos*, the Secretary to the Bromley Gas Company since 1890, was next called. He said that previously he was Chief Clerk in the office, and had never heard of any agreement in writing between the two Companies. He entered the Company's service in 1863. He had searched, but found no trace of such a document beyond what had been disclosed. He never heard of any agreement being come to in 1884.

Cross-examined: There was no entry in the Company's minute-book relating to the Act of 1865, except one statement by the Chairman that the petition had been sealed. He was not aware of any case in which a gas company had laid mains in a portion of the district within their parliamentary limits which was already supplied by another company.

Mr. *Alexander Dickson*, Chairman of the Bromley Company since the death of Mr. Latter, and a Director since 1890, was the next witness. He spoke to interviews with Mr. May, in 1897. No reference was made to a written agreement having been signed in 1865. There were subsequent interviews between himself and the Deputy-Chairman on the one hand, and Mr. May and one of the plaintiffs' Directors on the other; but it was understood that, unless an arrangement were come to, nothing should be said as to what passed.

Witness was shortly cross-examined on some of the correspondence, which he said was not in his mind when this dispute first arose.

Mr. *W. Whitaker*, F.R.S., F.G.S., said he had made a survey of the district in question, and recently went over the ground, and marked on a map the boundary of the watershed between the Ravensbourne and the Cray. The workhouse at Farnborough was well on the Ravensbourne side. [The map was put in.]

Cross-examined: It was not easy for an uninstructed person to define the watershed of the district.

This concluded the evidence; and the further hearing was again adjourned until after the Whitsun Vacation—his Lordship remarking that it was a great pity old friends and neighbours could not come to an arrangement.

The Winding Up of the Patent Gas Enrichment Syndicate.

Meetings of creditors and shareholders in the above-named Company (now in liquidation) were held at the offices of the Board of Trade, Carey Street, Lincoln's Inn Fields, last Thursday, when the Official Receiver (Mr. S. Wheeler) made his report. He stated that the Company was registered in December, 1897, with a nominal capital of £20,000, in £10 shares, to carry on the business of gas enrichment spirit manufacture under a patent process. The promoter was Mr. Thomas Fenwick, of 63 & 64, New Broad Street, E.C.; and Miss Curtis, a clerk to that gentleman, had acted as Secretary throughout the existence of the Company. Under an agreement, dated Dec. 14, 1897, Mr. Fenwick agreed (1) to pay the expenses of the promotion of the Company and of issuing the capital, (2) to assign to the Company the patent No. 2515 of 1897, granted to Herbert John Dawes, and stated to be for gas enrichment spirit and plant in connection therewith, and (3) to erect an installation of plant with a minimum capacity sufficient for the purpose of starting the business. The consideration to be paid to Mr. Fenwick for these services was fixed at £35,000, payable in cash, debentures, and shares. It appeared that the patent in question was granted to Mr. Dawes on Nov. 27, 1897, for improvements relating to an apparatus for the distillation and breaking up of liquid hydrocarbons, and similar substances, and did not relate to the process for the manufacture of gas-enrichment spirit. He (the Official Receiver) was further informed that the apparatus comprised by the invention had never been made. In February, 1898, Mr. Dawes agreed to sell the patent to the Company for £50 cash and £100 in shares, on the promise of employment at £3 per week. The first prospectus was prepared by Mr. Fenwick, approved by the Directors, and issued on Dec. 14, 1897. It offered 2000 £10 shares, and also 2000 £10 debentures, constituting a first charge on the whole of the assets of the Company, and bearing 5 per cent. interest. The prospectus stated that the Company was formed to acquire the valuable patent right and special process for the manufacture of "Richolene"—a superior gas-enriching spirit; also that the estimated annual profit was £7395. In response to this prospectus, applications were received for 10 shares, which the Directors proceeded to allot on Dec. 21, 1897. A second prospectus was issued in January, 1898; and in the following May a third was sent out. The latter contained a statement that considerable progress had already been made with the works, which was untrue. The Company received applications for, and duly allotted, 158 shares and 32 debentures, in respect of which £1677 10s. was paid in cash. Mr. Dawes had stated that no payment whatever had been made to him in respect of the purchase of his patent rights, which he had consequently never assigned to the Company or to Mr. Fenwick. It appeared that although various payments had been made and debentures issued to Mr. Fenwick under the purchase contract, he had never been in a position to assign the patent to the Company, and had not fulfilled his agreement to erect an installation of plant on a plot of land leased by the Company at Belvedere, except by having set up two second-hand iron sheds of no use whatever for the erection of plant or machinery. The Company commenced proceedings in October, 1898, against a share applicant to enforce payment of calls. This action was defended on the ground that the applicant had been induced to apply for the shares by false and fraudulent representations and concealment of material facts in the prospectus. The Court directed the Company to remove the name from the register of members, and to repay the £25 that had been paid in respect of the shares. The Company was controlled throughout by Mr. Fenwick, who received £1445 out of the £1694 paid into the Company's banking account. In the opinion of the Official Receiver, the Company was promoted by Mr. Fenwick solely for his own benefit, and not with any *bonâ fide* intention of carrying out the object for which it purported to be formed. There was no independent Board of Directors they having apparently acted under the directions of Mr. Fenwick, and not in the interests of the shareholders, especially in going to allotment on a totally inadequate subscription, and in paying to that gentleman practically the whole of the amount subscribed. He was bound to think that the failure of the Company was entirely due to these facts, and to Mr. Fenwick's omission to carry out his agreement to assign the patent to the Company, and to erect plant and machinery for its use. These matters would be reported to the Court, and an application would be made for a public inquiry into the whole case, which appeared to be saturated with fraud. There were no assets of any value to meet the claims on the debentures, as there was £60 due for rent, and the sheds would probably not fetch 5s. This was not the first occasion upon which he had made the acquaintance of Mr. Fenwick under similar circumstances; and it would be his duty to lay the facts before the Public Prosecutor. A resolution was passed for the winding-up proceedings to be left in the hands of the Official Receiver. We learn from the "Financial News," from which the foregoing particulars have been taken, that Mr. Fenwick was invited to address the meeting of shareholders; but he declined to make any statement.

Under the heading of "Strong Words at Carey Street," the "Pall Mall Gazette" last Friday commented upon the above matter as follows: "We have had occasion ere this to criticize unfavourably the schemes propounded by Mr. Thomas Fenwick. . . . Yesterday, Mr. Wheeler, as Official Receiver, had before him the matter of the liquidation of the Patent Gas Enrichment Syndicate—a concern criticized in hostile fashion, as it deserved, at the time of its inception. The Official Receiver was extremely strong in some of the remarks made by him in regard to this promotion. In his opinion, he stated, the Company was promoted by Mr. Fenwick solely for his own benefit, and not with any *bonâ fide* intention to carry out the object for which it purported to be formed. He proceeded to advance certain contentions in justification of this conclusion, and stated that the facts would be reported to the Court, and that an application would be made for a public inquiry. So that we may probably hear more of the matter before long."

Damages Against a Director of the Meteor Incandescent Lighting Company.

In the Queen's Bench Division last Friday, Mr. Justice Bruce delivered judgment in the case of *Forrester v. Bateman*, which was an action to recover damages for alleged fraudulent representations. Plaintiff said he was induced to take 100 shares in the Meteor Incandescent Lighting Company on the representation of the defendant, who was a Director, that the Company was in a sound condition. He further said the defendant fraudulently concealed from him the fact that an action was pending in which the validity of the patents which the Company was formed to work was impugned. The Company was registered in October, 1895, with a nominal capital of £140,000, to work certain incandescent patents, and defendant was appointed one of the first Directors. Plaintiff alleged that in February and March, 1896, he met the defendant, who represented that the concern was a sound one, and that it was absolutely certain to return a good profit in a short space of time. Defendant admitted informing the plaintiff that he thought the Company was a good thing, and would make a profit in a short time. He, however, denied that he knew at the time that the patents were impugned. The liabilities of the Company in March and April, 1896, exceeded the available assets; and it was impossible to avoid the conclusion that the defendant must have known, on March 20, that the Company was pressed for money. The action of the Welsbach Incandescent Company against the Meteor Company was successful; and the plaintiff said that if he had been told that the validity of the patents was in question, he would not have invested his money. His Lordship said he was of opinion that the plaintiff was entitled to succeed; and therefore he gave judgment for him, and assessed the damages at £100.

Fraudulent Consumption of Gas.

At the Barry Police Court, a few days ago, William Kerslake, residing at 55, Bell Street, Barry, was summoned for fraudulently obtaining gas belonging to the Barry District Council. Mr. J. A. Hughes, who appeared for the prosecution, said defendant had a prepayment meter for supplying his house, and one of the collectors, calling there a little earlier than usual, found that the meter had been removed, and a pipe so placed that gas passed to the burner without being registered. Defendant had since written to the Manager of the gas-works (Mr. F. M. Harris), and also to the District Council, admitting the offence, but adding that he had been guilty of it because he had no money in the house, and his wife was ill at the time. He had only recently got employment. The Council, under the circumstances did not press for a heavy penalty. Defendant was fined 5s., including costs.

Cutting Off Domestic Water Supplies at Newcastle.—The Newcastle Corporation are promoting in Parliament a Bill in which is a clause requiring the Newcastle and Gateshead Water Company to give notice to the Corporation within four days of the water supply to any private house being cut off, or in default to be liable to a penalty of £10. The Company took exception to this; and the Sanitary Committee of the Corporation, in order to avoid friction, have made an alteration to the effect that notice be given within seven days, or in default a nominal fine of 20s. be inflicted.

Bolton Corporation Water Supply.—At a recent meeting of the Water Committee of the Bolton Corporation, the balance-sheet for the past financial year was under consideration. It showed that the total income was £62,631, an advance of more than £2000 on the preceding twelve months' operations. The supplies for domestic services produced £37,617; and trade supplies, £17,602. The expenditure for the year aggregated £45,481—a decrease as compared with the previous twelve months. Of this sum, £2510 was absorbed in salaries, and £5933 in the maintenance of works. The Committee resolved that £2149, a portion of the credit balance, should be carried to the renewal fund account, and that £15,000, the remainder, should be transferred to the borough fund in aid of the rates. Last year £1000 was placed to the renewal fund account, and £13,848 handed over in relief of rates.

MISCELLANEOUS NEWS.

BIRMINGHAM CORPORATION GAS AND WATER UNDERTAKINGS.

Steady Development of the Gas Business—The Saltley Extensions—The Augmented Cost of the Contracts for the Elan Valley Water-Works.

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Until the Welsh water arrived, there would be a steady increase in the pumping; and it was satisfactory to know that, when the water was received from Wales, the pumping would be reduced to very small proportions. Turning to the profit and loss account, he said the profit was £13,246 less than in the previous year; but the interest on the new capital expended, and sinking-fund charges on the old capital, had exceeded the difference of profit between the two years by £1500, and entirely accounted for the reduced profit now. The forecast estimated a loss of £8000 during the past year; so that, having made a substantial profit instead of a loss, there was a difference of £23,000 to the good as compared with what was foretold. The finances of the department generally were satisfactory, though the Committee had had many drawbacks to contend with. The consumption of water had increased during the year; and the increase was explained by the fact that the estimated population was 23,000 more than in the previous year, and by the abnormal consumption during a period of drought. Dealing with the Elan supply, Alderman Parker pointed out that the rainfall for the last six months on its watershed was from 24½ to 28 inches., while at the Whitacre station for the same period it was 6½ inches. They had now pierced all the important tunnels; and the work had come out accurately in every case within an inch. All the contracts for the aqueduct had now been let. He had recently had to inform the Council of several large contracts that had come out greatly in excess of the parliamentary estimate. This had been the common experience latterly of all bodies who had required building work of any kind. The Council had had a large experience during the past six months of very great increases in actual cost over estimates. Therefore it was not to be wondered at that estimates made for parliamentary purposes in 1891 and 1892 should be considerably exceeded at the present time. During the last five years at least, there had been a continuous upward movement in everything connected with building. There had been a great advance in materials—especially in iron and steel—in cement, and in bricks; there had been also substantial advances in wages. Then in consequence of the active state of trade, they had found it by no means easy to get contractors to tender at all for the latter part of the work; all the great firms being busy with railway, dock, and harbour contracts. The difficulty, perhaps, was partly due to the fact that the Corporation required exceptionally good work. In one instance they had only one tender; and the Committee seriously thought it would be necessary to do that section of the aqueduct themselves by administration. The tender, however, was a reasonable one; and the contractor having made some concessions, the Committee decided that it would be more economical to let him do it than to do it themselves, especially as they would have to buy a large plant which would be of comparatively little value to them afterwards. It was said that the minimum standard rate of wages clause in their tender forms, and, during the last twelve months, the Workmen's Compensation Act, had helped to raise the prices quoted by contractors. Reviewing the figures of the various contracts as compared with the parliamentary estimates, Alderman Parker said that the first, let in 1894, was only 2·13 per cent. in excess. The second contract, let two years later, was 18·74 per cent. in excess. Speaking generally, the contracts that had most exceeded the parliamentary estimate were those in which there were the largest quantities of iron and steel. The first contract in which pipe-lines were included was only 5 per cent. in excess; the second, about 25 per cent.; and the next, which was all pipe-line, 28·53 per cent. The fourth contract, which was let in 1898, was 48·35 per cent. in excess; and the fifth, also let in 1898, 45·37 per cent. Unfortunately, these were two of the largest contracts. Then they had a small contract this year which was a little less than 10 per cent. over the parliamentary estimate; but only about one-tenth of that was pipe-line. The excess in the contracts for the aqueducts amounted in all to £463,654, or about 28 per cent. above the parliamentary estimate. It was difficult to compare the cost of the Frankley works with the parliamentary estimate, because the details had been altered; but the contract was 4·13 per cent. in excess, and something would have to be added for certain things that would be required subsequently. To sum up, the whole of the contracts, including the items he had added to the Frankley works, showed an excess of £500,000 over the parliamentary estimates. He should prefer to call it £550,000, because it was certain that there would be some extras on the present contracts, though the Committee believed that these would be exceedingly small; the Engineers having so arranged the contracts that it was impossible to have any but *bonâ-fide* extras.

Mr. Lancaster: Will the Chairman of the Committee tell us what the gross amount of the contracts is to-day?

Alderman Lawley Parker replied that the gross amount of the contracts for aqueducts was £2,085,574, and of those for the Frankley works £314,428, or £2,400,000 in all, as compared with the parliamentary estimate of £1,923,000—giving a difference of £476,000. Adding to this what he thought would be the expenditure on engines and filter-pans at Frankley, he made the difference £500,000. It was fair to remind the Council that he had already told them that the works the Committee were doing themselves in the Elan Valley would certainly exceed the parliamentary estimate by a considerable sum. The increase in the cost of materials and wages affected the Elan Valley works, as it had the contracts; and, in addition, they had had difficulty in finding suitable stone on the spot and in getting good foundations for the dams. He was afraid also, though he did not think so at first, that there might be an increase on the whole as far as the land was concerned. There certainly would be an increase in the proportion of the land that was placed in the estimates that were submitted to the Council in 1891 for the first instalment of the scheme. Only half the watershed was placed in that estimate as being chargeable to the first instalment; but the Act of Parliament required all the purchases on the watershed to be completed within ten years, or, rather, that was the period within which the land could be acquired compulsorily. Although they had received from those

lands during the past year a rental of £1760, still he was afraid the estimate for the land would be exceeded. It certainly would be exceeded for the first instalment. It might be asked why, seeing that prices of materials, &c., were low at the beginning, they did not place all the contracts at once. Their scheme was to so place the contracts that they should all be completed together; the object being to defer capital expenditure until it was really needed. This policy, the Council would agree, was sound; but it happened that the markets had been against them, as they had been against all who had undertaken public works in the past five years. But they could not have placed the contracts earlier, because the Engineers would not have been able to get out the thousands of drawings and settle all the details which must be ready before tenders could be invited, and which required years to prepare. He did not want the Council to take too gloomy a view of the position. It was but fair to say that there were some set-offs. There was the improvement of the rental, which would do something to meet the charges on the increased capital employed. There was also the selling value of the discarded pumping-stations and works, including not only the break-up prices of the plant, but the value of the land. This, which was not taken into account when the scheme was first submitted to the Council, was no inconsiderable item, and would do something towards filling the hole made by the increased cost of the works generally. At the same time, he must prepare the Council for an excess of capital expenditure disturbing the forecasts of the future accounts of the department. Later on they would know what the other works would cost. But they had only now one small contract to let—that for the Warley reservoir to which the water would be pumped to supply the higher levels; and it would only remain to be seen what the extra cost would be of the works in the Elan Valley which they were doing themselves. The parliamentary estimate for that was about three-quarters of a million.

After a short discussion, the report was unanimously adopted.

BOLTON CORPORATION GAS SUPPLY.

A Prosperous Year's Working.

At the Meeting of the Bolton Town Council last Wednesday, Alderman Miles, the Chairman of the Gas Committee, explained the principal points in the annual balance-sheet of his department. He said the working for the past year established a record both in regard to the progress made and the prosperity achieved. They spent on capital account £12,839; but this was money expended on what he called immediately productive works. Their capital account, which had been described by some people as excessive, stood to-day at £685 per million cubic feet of gas sold, as against £1059 when the works were acquired by the Corporation 26 or 27 years ago; and he desired to say that, since the works were bought, they had been practically rebuilt. When the undertaking was acquired by the Corporation, it was being worked absolutely to its full capacity; while to-day they could make, he should think, 100 million cubic feet more gas without the expenditure of much capital beyond the construction of retort-houses and the erection of purifying apparatus. The members of the Council would therefore see that the capabilities of their works to-day were marvellously better than they were when purchased by the Corporation. It had been proposed by the Gas Committee this year to depreciate the capital account by £5000; but the Finance Committee had raised an objection to this. He was quite prepared to admit that there was some weight in the arguments adduced, because if they paid off this capital they could not borrow it again, and perhaps at the present juncture it would not be wise to reduce the account as suggested. Therefore he was quite prepared to accept a friendly amendment to the effect that the £5000 should be transferred to the reserve fund account, to be used possibly in renewals which would certainly be required before very long in providing new retort-houses at the Lum Street works, and the introduction of mechanical stoking there. Turning to the revenue account, they had sold 49 million cubic feet more gas than in the preceding year; and for this they had received £5690. There had also been an increased return amounting to £1385 from coke, and of £1949 from sulphate of ammonia; while the extra profits from the fittings department aggregated £512—making a total increase of £9536 on the twelve months. He was sure this was very gratifying to everybody concerned. On the other hand, coal had cost them £2888 more; and he ought to tell the Council that though they paid, on an average, from 3d. to 6d. per ton more than before, such was the general excellence of the management that the actual increase was only 1d. more per ton. The total turnover for the year was £143,397, or an increase of £8777; the gross profits being £3081 more, and the net profits £2218 more than in the previous year. His Committee had resolved to recommend the Council to reduce the price of gas by 3d. per 1000 cubic feet; making it 2s. 3d. net. The estimates made showed that this would mean a loss of £10,500 in revenue. This was a large sum; and no doubt some members of the Council would like to know whether or not it would be recouped in the near future. He might say that the prospective increase in the cost of coal for next year was put down at £5000; but this was to some extent minimized by the fact that they had yet to receive on the old contracts at a lower price between 25,000 and 35,000 tons. They hoped to get £2600 extra for tar, £2500 for coke, and £500 for sulphate of ammonia—together, £5600. This would cover the extra cost for coal, and leave £600 to the good. Therefore the loss in revenue by the reduction in price would be practically £10,000. He paid a compliment to the staff at the gas-works, for the manner in which they had carried out their duties. Mr. Holt believed in the consumers sharing their prosperity, and hoped the Committee's decision to reduce the price would not be opposed by any member of the Council. After a friendly amendment had been moved and carried, to the effect that the £5000 proposed to be allocated to reduction of capital be placed to reserve fund account, some discussion took place upon the question of the gas undertaking earning large profits. Alderman Miles expressed the opinion that it was desirable that a reasonable sum should be handed over out of the profits in aid of the rates; but he agreed that from £20,000 to £25,000 was too large an amount. The balance-sheet, with the alteration agreed to, was then adopted by the Council.

SINGAPORE GAS COMPANY, LIMITED.

The Municipality and the Works—The Prospects of Electric Lighting.

The Annual Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. Samuel Spencer presiding.

The Secretary (Mr. R. M. Christie) read the notice convening the meeting; and the report and accounts, to which reference was made in the "Journal" a fortnight since, were taken as read.

The Chairman, in moving the adoption of the report and balance-sheet, remarked that the past year's working and the position of the Company were the best they had experienced for many years. This was the 37th annual meeting; and he desired to take a retrospective glance at their affairs. When the Company was created in March, 1862, with the then satisfactory charge to all parties of $3, or 13s. 6d. sterling, per 1000 cubic feet of gas, they had the promise of at least an estimated dividend of 12 per cent. It was almost unnecessary to remind the shareholders as to how far the realization of this promise had been fulfilled. Instead of the bumper dividend named, they had had to put up with an average distribution of 4¼ per cent. during the life of the Company, which, to say the least, was a miserable return for their money. If the capital of the Company had been invested at home in Consols, instead of in this Colonial enterprise, the dividends would have been about the same, and the principal at the present moment would have been worth nearly 50 per cent. more. Or if their investment had, in 1862, been put in the South Metropolitan Gas Company, the dividends would have been from 5 to 14 per cent., and the capital worth to-day three-and-a-half times as much. He therefore thought he was fully justified in saying they had had a miserable return from Singapore for the capital expended. The shareholders were aware that the Company were now in the throes of a crisis, as their concession was at an end, and they were merely working under a contract which ran till the end of the year. The Municipality had been considering for some months what they would do; and during last year the Directors were pressed to name a price they would take for the works, if the Municipality decided to buy. After much deliberation, they cabled that they would recommend the shareholders to accept £55,000; the stock and other assets being taken at a valuation. This the Board would have to abide by; and it would pay the Municipality well to purchase the works at that price, seeing that the past year's earning power would pay them 5 per cent. on the transaction. As the Municipality could borrow money at 4 per cent., this would at once give them about £1000 a year clear profit; and consequently they would, at the price named, obtain a highly satisfactory bargain. As Directors, however, the Board would much prefer having another contract with them for 7, 14, or 21 years, and hoped that this would be granted, as, after the Company's 37 years' connection with the Colony, they certainly considered they were entitled to generous treatment. If, however, the Municipality decided to buy the Company out, the shareholders would see that the £55,000 asked was only 15½ years' purchase of last year's net profits of £3560—a rate which, the Board ventured to think, any gas engineer of standing would recommend as a most favourable purchase for the Municipality, and a price which he could not for a moment hesitate to recommend should be paid to the Company. Turning to the balance-sheet, the Directors were pleased to say that, without exception, it was the clearest and most satisfactory in every particular that had ever been presented to the shareholders. Anyway, it was the best financially for the past seven years, as at the beginning of that period the great fall in silver took place; and the dollar, which up to then had averaged from 3s. 3d. to 3s. 6d. in value, began to fall and continued to do so until a year ago, when it touched the low price of 1s. 9½d. His opinion all along had been that it could not go below that, as it did not pay to produce silver at such a figure. Since then it had gone up to from 1s. 11d. to 2s. 0½d.; and for months the value had not varied in price more than 1d. He was pleased to say the average price of the dollar for the past year had been 1s. 11⅞d., or ⅛d. more than in the previous year. The new beds of retorts which had been constructed had cost about £1300; and in the present accounts this had been entirely written off. The Board had also written down the amounts owing to their sterling value of 2s. for the dollar; so that altogether the accounts were now presented in a most satisfactory manner. An additional £500 had been put to the contingent fund; making it £1000. There was left £1400 for paying the dividend now recommended of 1¾ per cent. (making 3 per cent. for the year), and leaving £357 to carry forward. On Dec. 31, the Company owed £1730; but the stocks, &c., were worth three times as much, every penny of which the Board thought would be obtained, as they had from time to time written the values down to below the actual cost price. The works and plant were in excellent order; the leakage being perhaps the one thing that required reducing. This was having the closest attention; and services were being renewed wherever it was found necessary. Since the commencement of the year, things had been going on fairly well; and the Directors felt sure that this year's working would be of a gratifying character. Last month the Board had the pleasure, for the first time in the history of the Company, of finding themselves in the happy position of not owing a penny for anything; and they had also the satisfaction of having the money in hand for the present dividend. After the past five years' anxiety that the Board had passed through, the shareholders could hardly imagine how pleased they were that they had got the ship into such smooth water; and he thanked the shareholders for their kind consideration and support through such trying times. Last month the Board had to send out about 2500 tons of coal to meet the requirements to Christmas next; and they had to face an increased cost both for coal and freight. They were, however, fortunate in making a satisfactory bargain for both; and the extra expense resulted in only a slightly higher percentage on the price. This they quite hoped to regain from the increased price for residuals.

Mr. W. T. Batten seconded the motion.

The Chairman, replying to questions by Mr. S. Hill Dean, Mr. Walter Benson, and Mr. Samson, stated that the £55,000 at which the works had been offered to the Municipality would produce perhaps a little more than £3 per share. The Municipality had the question still under consideration. The contingent fund was used as floating capital; but the Company had in the bank and at the office about £2400. They had never been in such a good financial position before. In the first half of

last year, the leakage was under 6 per cent.; but, unfortunately, in the second half it reached 17 per cent., owing entirely to the Municipality commencing to use a steam-roller and laying a new water-main. They were, however, repairing the gas-mains. One good thing had arisen out of the proposed buying of the Company by the Municipality—that was, every main in the district, or about 50 miles of pipes, had been inspected by them. They were found to be in good condition; but some of the services needed renewing.

Mr. H. W. Smith (formerly the Manager of the Company) remarked that anyone having a knowledge of the many difficulties which the Directors had experienced in their endeavours to improve the financial position of the Company could, with sincerity, congratulate them upon the promising aspect of the balance-sheet. He had never seen the Company with such few liabilities as at present.

Mr. Dean asked whether the Directors had taken into consideration the desirability of supplying the electric light.

Mr. Batten, in reply, said the question of electric lighting had been constantly before the Board; but they considered it was best to leave it alone. There were no profits to be made out of it; on the contrary, there was the certainty of a loss. The disadvantages under which the Gas Company laboured in Singapore would apply to an electric lighting undertaking in a greatly increased degree. The latter to work advantageously required a large demand within a relatively small and concentrated area; but the conditions under which the Gas Company were working were the very opposite to this. Without considering the question of expense, which was an important one, as copper mains would be necessary for the low-tension system (which alone would be suitable for Singapore), he found, from tables published in a leading electrical journal, that, out of 56 towns working under Provisional Orders in the United Kingdom, 22 made a loss during the last completed year; and the bulk of the 56 had had only meagre margins of profit. If this was the result in the densely packed towns in this country, where there were streets of shops and houses within a limited area from which the electric lighting undertaking could draw their revenue, the chance of working an electric lighting installation on remunerative lines in a place like Singapore appeared absolutely impossible. In Singapore, they had 53 miles of gas-mains; and in some districts there was not a single consumer on a mile length of main, and the street-lamps were widely scattered. This condition—the small consumption per mile of main—would always continue, partly for climatic reasons, as offices and shops mostly closed before dusk all the year round. Many of the wealthy native consumers also had a bad habit of keeping their main taps shut for weeks together, using gas only on high days and holidays, and at other times making shift with one or two portable oil-lamps; and if these consumers went to the expense of installing the electric light in their houses, they would undoubtedly continue the same principle.

Mr. Robbins urged the Directors to adhere to the price at which they had offered the works to the Municipality, and advocated firmness in dealing with them.

In the course of further discussion, the general view was that the Company ought not to remain longer in their present precarious position; and that the Directors should press the Municipality to come to some immediate decision regarding the Directors' offer, or to renew the contract for a term of years—the action the Directors had so far taken receiving the support of Mr. Simmelkjör, Mr. Richardson, and other prominent shareholders.

On being put to the vote, the motion was carried unanimously.

Resolutions were next passed declaring the dividend recommended and re-electing the retiring Directors (Mr. Samuel Spencer and Mr. W. T Batten) and the Auditors (Mr. Magnus Ohren and Mr. T. Guyatt).

The Chairman then moved a vote of thanks to the Engineer and Manager (Mr. Albert Ford), the Secretary (Mr. Christie), and staff. In seconding the motion, Mr. H. W. Smith asked to be allowed to mention in the resolution the name of Mr. Page, who was the oldest servant of the Company at Singapore, was a good accountant, and had always conscientiously discharged his duties. Mr. Batten endorsed this; and the resolution was cordially agreed to.

The services of the Directors were next heartily acknowledged on the motion of Mr. Dean, seconded by Mr. Samuel While.

A well-deserved honorarium of 50 guineas was afterwards voted to the Secretary in consideration of his having been 14 years with the Company, and for the last eight years having received no increase of salary; and his acknowledgment concluded the proceedings.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Office, Marylebone Road—Mr. E. Boulnois, M.P., in the chair.

The Secretary (Mr. F. H. Wybroo) having read the notice convening the meeting, the report and accounts were taken as read. He afterwards read the Auditors' report, which stated that the capital of the Company was the same as reported last half year—namely, £1,641,863—and the total expenditure on works had amounted to £1,676,678, including the outlay in the past half year of £23,561. The revenue for the six months ended Lady-day last had been £140,424; showing an increase of £4718 on that of the corresponding period of last year. The water-rental for the six months had amounted to £126,654; and the balance to the credit of the dividend and interest account was £64,356.

The Chairman remarked that the report and accounts spoke for themselves as to the continued prosperity of the Company; and it must be gratifying to the proprietors to know that their property was maintained so well, and that all the works were kept at the highest point of efficiency and utility. During the half year, the Company had laid on 733 new supplies—a very large number, which would continue to increase. There was no doubt that provision would have to be made to meet the wants of their rapidly growing district to the north-west of London; and this would necessarily involve a further outlay of capital hereafter. The proprietors would remember that an intimation was given to them at the last meeting that the Directors were about to proceed to Parliament for powers to lay an additional main from the intake at Hampton to the subsidence reservoirs at Barnes and Barnes Elms. This application became necessary, not only on account of the Company's increased business, but also in view of the possibility of their being called upon to help their neighbours in the event of any unforeseen breakdown, or of the recurrence of a drought such as that which prevailed last year.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1361.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p. c.	21½—22½	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	15½—16½	..	4 10 11
300,000	100	Jan. 3	5	Australian 5 p. c. Deb.	104—106	..	4 14 4
200,000	5	May 12	6	Bombay, Ltd.	6¾—7*	..	4 5 9
40,000	5	,,	6	Do. New, £4 paid	4½—5*	..	4 16 0
380,000	Stk.	Feb. 24	12	Brentford Consolidated	275—280	..	4 5 9
240,000	,,	,,	9	Do. New	215—220	..	4 1 10
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	Dec. 15	4	Do. 4 p. c. Deb.	128—133	..	3 0 2
220,000	Stk.	Mar. 29	11½	Brighton & Hove Orig.	265—270	..	4 5 2
226,320	,,	,,	8½	Do. A. Ord. Stk.	194—197	..	4 6 4
973,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Mar. 29	10	British	47—49	..	4 1 8
50,000	10	Feb. 24	12	Bromley, Ord. 10 p. c.	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c.	20—22	..	4 1 10
500,000	10	Apl. 27	6	Buenos Ayres (New) Ltd.	10½—11½	..	5 6 8
220,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb.	103—105	..	3 16 2
150,000	20	Mar. 10	8½	Cagliari, Ltd.	28—29	..	5 13 10
100,000	10	Sept. 29	7	Cape Town & Dis., Ltd.	13¾—14½	..	4 16 7
50,000	50	May 2	6	Do. 6 p. c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Apl. 13	13½	Commercial Old Stock	312—317	..	4 5 2
200,750	,,	,,	10½	Do. New do.	245—250	..	4 4 0
200,750	,,	Dec. 15	4½	Do. 4½ p. c. Deb.	145—150	..	3 0 0
800,000	Stk.	Dec. 15	10	Continental Union, Ltd.	207—212	..	4 14 4
200,000	,,	,,	7	Do. 7 p. c. Pref.	188—193	+1	3 12 6
51,650	Stk	Feb. 24	14	Croydon A 10 p. c.	305—310	..	4 10 4
168,400	,,	,,	11	Do. B 7 p. c.	255—265	..	4 3 0
555,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p. c.	130—135	..	3 17 9
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd.	23—24	..	4 11 8
354,060	10	,,	11	Do. £7 10s. paid	17—18	..	4 11 9
14,993,075	Stk.	Feb. 10	4 %	Gas-light and Coke	4 p. c. Ord.	..	4 5 3
2,500,000	,,	,,	3½		3½ p. c. max.	..	3 8 0
3,799,785	,,	,,	4		4 p. c. Con. Pref.	..	3 1 7
3,843,975	,,	—	—		3 p. c. Con. Deb.	..	—
70,000	10	Nov. 11	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	May 12	10	Imperial Continental	224—229*	+1	4 7 4
473,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Deb. Red.	102—105	..	3 6 8
75,000	5	Nov. 30	6	Malta & Medn., Ltd.	5—5½	..	5 9 1
560,000	100	Apl. 4	5	Met. of	5 p. c. Deb.	..	4 8 6
250,000	100	,,	4½	Melbourne	4½ p. c. Deb.	..	4 0 4
541,920	20	Nov. 11	5	Monte Video, Ltd.	15—16	−½	6 5 0
617,946	Stk.	Feb. 24	9½	Newc'tle & Gatesh'd Con.	228—233	..	3 19 5
264,855	Stk.	Dec. 30	3½	Do. 3½ p. c. Deb.	107—110	..	3 3 8
					* Ex div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd.	7½—7¾	..	5 3 3
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—6¾	..	5 6 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¾—1¾	..	4 11 5
60,000	5	Mar. 29	7	Ottoman, Ltd.	4¾—5¼	..	6 13 4
500,000	100	Dec. 1	6	People's Gas of Chicago Bonds	103—106	..	5 13 2
848,070	10	Apl. 27	7	River Plate Ord.	11½—12	..	5 16 8
250,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb.	103—105	..	3 16 2
250,000	10	Mar. 29	10	San Paulo, Ltd.	16¾—17½	..	5 14 3
185,000	Stk.	Mar. 29	10	Sheffield A.	237—240	..	4 3 4
209,053	,,	,,	10	Do. B.	237—240	..	4 3 4
447,427	,,	,,	10	Do. C.	237—240	..	4 3 4
5,600,000	Stk.	Feb. 10	5½	South Metrop., 4 p. c. Ord.	139—142	..	3 15 1
1,460,000	,,	Jan. 18	3	Do. 3 p. c. Deb.	101—103	..	2 18 3
—	—	—	—	Tottenham and Edmonton A.	—	—	—
—	—	—	—	Edmonton B.	—	—	—
182,380	10	Dec. 30	5	Tuscan, Ltd.	9—10	..	5 0 0
149,900	10	Jan. 3	5	Do. 5 p. c. Deb. Red.	99—101	..	4 19 0
				WATER COMPANIES.			
746,184	Stk.	Dec. 30	11	Chelsea, Ord.	318—323	..	3 8 1
150,000	,,	,,	5	Do. 5 p. c. Pref.	168—173	..	2 17 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	150—155	..	2 18 1
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb.	155—160	..	2 16 3
1,720,560	Stk.	Apl. 18	7	East London, Ord.	218—222	..	3 3 0
654,740	,,	Dec. 30	4½	Do. 4½ p. c. Deb.	157—160	+1	2 16 3
390,000	,,	,,	3	Do. 3 p. c. Deb.	102—104	..	2 17 8
700,000	50	Dec. 15	7½	Grand Junction 10 p. c. max.	113—116	..	3 4 7
310,000	Stk.	Mar. 29	4	4 p. c. Deb.	135—140	..	2 17 2
708,000	Stk.	Feb. 10	14	Kent	360—365	..	3 16 9
160,000	,,	,,	7	Do. New, 7 p. c. max.	210—215	..	3 5 1
1,043,800	100	Dec. 30	10½	Lambeth, 10 p. c. max.	300—305	..	3 8 10
406,200	100	,,	8	Do. 7½ p. c. max.	230—235	..	3 8 1
350,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb.	135—140	..	2 17 2
500,000	100	Feb. 11	13½	New River, New Shares	433—438	..	3 2 9
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Deb.	137—142	..	2 16 8
902,300	Stk.	June 29	7½	South-wark and	Ord.	..	3 8 2
126,500	100	,,	7½		7½ p. c. max.	..	3 14 3
489,200	Stk.	,,	5		5 p. c. Pref.	..	2 18 6
1,019,585	,,	Apl. 13	4	Vauxhall	4 p. c. A Deb.	..	2 17 2
1,155,066	Stk.	Dec. 15	10	West Middlesex		..	3 5 2
200,000	,,	,,	4½	Do. 4½ p. c. Deb.	157—160	..	2 16 3
200,000	,,	Mar. 10	3	Do. 3 p. c. Deb.	102—104	..	2 17 8

The Bill had passed through the Committee of the House of Commons, and it was now to be dealt with by a Committee of the House of Lords; but it did not get through the House of Commons Committee without the usual opposition on the part of the London County Council. This body pleaded before the Committee that the Company had no need even of a further temporary supply from the Thames; and this the County Council stated in face of the interim report of the Royal Commission. It might appear uncharitable to make the suggestion; but the obstructive tactics of the London County Council certainly left people under the impression that any shortcomings on the part of the Water Companies which could be created by putting all kinds of obstacles in the way of their carrying out their lawful business, were useful for the object which the County Council had in view—namely, to depreciate and cheapen the Companies' valuable properties. The Company's Bill in Committee of the House of Commons did not escape the insertion of the sinking-fund clause, which was inserted by Parliament in 1886 in all the Metropolitan Water Bills which came before them in that year, when purchase was believed to be imminent. The provision had also been inserted since in other Bills brought before Parliament by the London Water Companies. It did not very much matter as far as their Company were concerned, because this contribution came out of profits; and as they were able, and would be able, to maintain their maximum dividend of 10 per cent., it followed that the consumers must pay this amount to the Chamberlain. He considered, however, that it was an unjust impost in regard to any of the Metropolitan Water Companies; and it was an impost to which no Provincial Water Company, and no gas, railway, or electric light company, was subjected. But he maintained that it was a peculiarly unjust impost in the case of the West Middlesex Company, as all their consumers would be deprived of rights which Parliament gave them many years ago—rights which they had enjoyed owing to the excellent manner (and he said this boldly) in which the Company had been managed, not only by the Directors, but also by the whole staff under them. In his capacity as Chairman of the Company, and also as Member of Parliament representing a very large district supplied by the Company, he endeavoured before the House of Commons Committee to preserve the rights of the consumers in this respect; but he was not successful. The Directors' report referred to the four Bills which the London County Council had introduced into Parliament—two in connection with the proposed purchase by that body of the Companies' undertakings, and two—a Reservoirs Bill and an Aqueducts Bill—to carry out the scheme of the County Council for bringing a supplementary supply from Wales. None of these Bills had yet been read a second time in the House of Commons. In the case of the Reservoirs and Aqueducts Bills, the House, on the second reading, refused to sanction their going any further until the report of the Royal Commission had been issued; and in the case of the Purchase Bills, the County Council themselves further delayed progress by saying that they would await the issue of the report. The Purchase Bills were, however, set down for second reading on the 1st prox.; and he sincerely hoped that the County Council would not ask for any further postponement. It seemed neither reasonable nor fair that the Companies should be kept in a state of suspense—and, of course, they were also incurring considerable outlay—as it appeared hardly likely that the report of the Royal Commission would be issued by the date fixed by the County Council. The Directors invited tenders for £100,000 of 3 per cent. debenture stock, which was the third portion of the £440,000 of stock created under the Company's Act of 1894; and the tenders were received on March 21. The stock was applied for more than three times over; and it was allotted at an average premium of £1 16s. 9d. per cent. He had spoken of the excellent manner in which the Company's affairs had been administered; and this was no set phrase. In Mr. Wybroo they had an admirable Secretary; and in Mr. Hervey they had an Engineer second to none in the water-works world. The efforts of these gentlemen, of the Directors, and of the heads of the departments, were backed by a staff which, from the highest to the lowest, was actuated by zeal and loyalty for the best interests of the Company. He concluded by moving the adoption of the report and accounts of the Directors and the report of the Company's Auditors.

The Deputy-Chairman (Mr. Jackson Hunt), in seconding the motion, stated that the Chairman, in his evidence before the House of Commons Committee, succeeded in thoroughly impressing on the minds of the latter the fact that the sinking-fund clause, when it came into force, would, as the Chairman had just said, operate on the pockets of the consumers before it touched the Company. He believed that the Committee thoroughly understood this; and he was in great hopes that it might do good in the future.

Mr. Chew said that he desired, as a small proprietor in the Company, and as a large consumer of water in East London, to express his gratitude to the Directors for the proposals in the Company's Bill before Parliament for relieving, if necessary, the needs of the people in the East London district.

The resolution was then carried unanimously.

On the motion of the Chairman, seconded by the Deputy-Chairman, a resolution was afterwards passed declaring a dividend on the consolidated stock for the half year ended March 31 last at the rate of 10 per cent. per annum, less income-tax.

Resolutions were also passed re-electing the retiring Directors and the Auditors, and electing Mr. A. H. Burton an Auditor; thanking the Auditors for their careful examination of the Company's accounts; and expressing the cordial thanks of the meeting to the Chairman and Directors for their diligent attention to the business of the Company.

The proceedings then terminated.

The Richmond (Surrey) Town Council and the Gas-Works.—At their meeting on the 9th inst., the Richmond Town Council appointed a Special Committee to consider and report as to the desirability and practicability of the Council taking over the gas supply of the borough.

Birkenhead Gas Profits.—In moving the adoption of the estimates at the meeting of the Birkenhead Town Council last Wednesday, Alderman Deakin stated that the Chairman of the Gas Committee had informed him that, instead of £8500 put down as next year's profit on the gas-works, he anticipated that it would be above £10,000.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The new gas-works to be erected by the Corporation of Glasgow at Blochairn are to be known by the name of the Provan works. Provan-hill lies to the east of the site. There is not much in a name in such matters; but "Provan" is more suitable than "Blochairn," as with the latter the pronunciation would, in the case of nearly every person from across the Border, have been "Blockairn."

The Dundee Gas Commission would seem to have at last reached the point where consideration ends and construction should begin, in connection with the extension of the gas-works. The adjourned meeting of the Committee, referred to in last week's "Notes," was resumed on Tuesday last; and to it all the members of the Town Council were invited. After a long discussion, the two proposals which were before the Committee last week were withdrawn. A resolution was adopted unanimously, to the effect "that the revised plan be adopted and approved of generally; that the Gas Manager be entrusted with the carrying out of the same, under the guidance of Mr. Foulis; and that the Gas Manager should get a competent draughtsman to assist him in making the working plans and specifications, which are to be subject to the revisal of Mr. Foulis." It appears that, according to Mr. Foulis's plan, there is to be a complete reconstruction of the gas-works; and when completed all that will be left of the present apparatus will be one gasholder capable of containing 1 million cubic feet, which was erected about eighteen years ago. An additional holder with a capacity of 4 million cubic feet will be erected; and the total cost of carrying out the work, which will be done gradually, and will occupy some four years, will amount to about £80,000.

The Edinburgh and Leith Gas Commissioners, on Tuesday of this week, paid a visit to the site of the new gas-works which they are about to erect at Granton. Of the whole area of 110 acres which has been acquired, the Commissioners are proposing to utilize at present about 0 acres. Some 400 men are now engaged at the place, chiefly making excavations, in the construction of railway lines which will traverse the works, in drainage operations, and in the formation of a large gas-tank. The field, which is being dug up, is already placed in connection both with the Caledonian Railway (Granton line) and with the North British system at Granton; a line of rails having been made at the cost of the Duke of Buccleuch from the harbour to the works. Along these lines contractors' plant and material of other kinds have been brought to the place. This portion of the property has a slightly upward slope from the seashore to the road; and excavations are being made on the high side, with the view of having the field levelled—an average depth of about 4½ feet being required to be excavated in order that this may be realized. All the material which is being dug out of the hole where the tank will stand is also being spread on the field for the same purpose. Other works in progress (which were pointed out by Mr. Herring) include the putting in of the foundations of a retort-house, which will be 400 feet long by 100 feet span, and a coal-store of the same dimensions. Solid piers of concrete of great size are being made; and between these arches will be built, which will carry the walls of the building. This will save excavations and cartage. Workmen are also engaged in building from west to east a large culvert, which is to carry a burn running through the property; and into the trench they are putting the pipes which will convey, by gravitation, the ammoniacal liquor from the retorts to a chemical works which are being erected on the shore. The gas-tank will be put down on the north-east side of the field. It will be 252 ft. 6 in. in diameter, and will have a capacity of 6½ million cubic feet of gas. The contract for it has been let to Mr. Wilson, of Glasgow, at a price of £19,000. A huge circular trench, which will go down 37 feet, and which at present has a width of 25 feet, is being excavated for the walls of the tank. In going down, most diversified strata have been passed through; and at one portion, where the extreme depth has been nearly touched, the workmen are engaged in blasting rock of a bastard whin. In the surface clays a large number of granite boulders were met with, some of them weighing as much as 2 tons; these having evidently been travelled, as geologists have pointed out, from Perthshire when the Forth Valley was scooped out by the ice. The bottom of this trench will be covered with puddle and concrete, so as to make it water-tight; and there will be an outer wall of brick and concrete, varying in thickness from 6 feet at the bottom to 2 feet at the top. It is not intended to excavate the whole of the interior of the circle. The inner slope of the trench will be shaded away, and a central cone thereby formed. This will save expense in excavation, and will in no way interfere with the capacity of the gasholder. An inspection was also made of the chemical works. These are being built on the seashore, in front of the old quarry hole, which was formerly used as a marine station. This work, which will cost about £4000, is not of great extent. It will be a building over 100 feet in length; and in it the ammoniacal products will be treated, chiefly for the production of sulphate of ammonia. The walls will be built of brick, faced with grey sandstone. It will be a one-storey building, lighted from the top; and in order that there may be as little contamination of the neighbourhood as possible with the fumes, the ventilation will be by shafts, carried direct into a chimney, which will be built alongside of it, and which will rise to a height of 105 feet. The party afterwards proceeded to the site of the old quarry by the roadside. Out of this quarry stone was taken fifty years ago for the building of Granton Harbour. It is now filled with water, the overflow of which is utilized by works on the shore. Borings which have been put down in the vicinity of the quarry have disclosed the fact that a valuable seam of stone still exists there of the same quality as Craigleith; and it is proposed to drain the quarry and work it again for building material, which will be used in connection with the erection of the different departments of the gas-works. The field under which this stone is was to be mainly utilized for working men's houses; but under the new circumstances which have emerged, another site will be found for the houses at an equally convenient, but less valuable, part of the ground. It was stated that the first instalment of the works might be expected to be ready in about 2½ years from now; and that when this was done, it would be possible to shut down the Leith works and dispose of the site. Then the

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BLACKBURN	1,250,000	OTTAWA (Second Contract)	250,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000	BRANTFORD (Remodelled)	200,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	ST. CATHERINES (Remodelled)	250,000
COLCHESTER	300,000	KINGSTON, PA.	125,000
BIRKENHEAD	2,250,000	PETERBOROUGH, ONT.	250,000
SWINDON (New Swindon Gas Co.)	120,000	WILKESBARRE, PA.	750,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000	ST. CATHERINES (Second Contract)	250,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000	BUFFALO, N.Y.	2,000,000
HALIFAX	1,000,000	WINNIPEG, MAN.	500,000
TORONTO	250,000	COLCHESTER (Second Contract)	300,000
OTTAWA	250,000	YORK	750,000
LINDSAY (Remodelled)	125,000	ROCHESTER	500,000
MONTREAL	500,000	KINGSTON, ONT.,	300,000
TORONTO (Second Contract; Remodelled)	2,000,000	CRYSTAL PALACE DISTRICT	2,000,000
BELLEVILLE	250,000	DULUTH, MINN.	300,000
		CATERHAM	150,000

AND ADDITIONAL WORK.

second instalment of the works will be proceeded with; and this will take the place of the present Edinburgh works, leaving the third section of the ground open for future extensions as required.

The annual meeting of shareholders of the Stonehaven Gaslight Company was held on Monday. It was reported that the total value of the plant of the Company was £3646, and that the profit for the year was £769. A dividend at the rate of 3s. per share was paid. The Chairman reported that the gas sold was practically the same last year as in the preceding twelve months.

Another Welsbach infringer has been laid by the heels. In the First Division of the Court of Session on Tuesday, the Welsbach Incandescent Gaslight Company, Limited, lodged a petition and complaint against David M'Mann, residing and carrying on business at 13, South Street, Perth, in which they alleged that the respondent had been guilty of breach of interdict. In July last, the complainers obtained interim interdict of the respondent selling mantles for incandescent gas lighting which, they said, were an infringement of patents held by them. The interdict was made perpetual on October 22. Both interdicts were served upon the respondent; and it was averred he had, since the service, continued to deal in mantles, several instances being given in which sales were made in Perth. M'Mann, when the petition and complaint were presented last session, denied that he had been guilty of infringement. He now stated at the bar that he wished to withdraw his defence, and to plead guilty to the complaint. Mr. Clyde, for the complainers, said that M'Mann went to Belfast; and they had considerable difficulty in effecting service upon him. Counsel moved for sentence, and pointed out that on the occasion of the first case of breach of interdict, in connection with the sale of these patents, the sentence was one month's imprisonment, and in the second case the sentence was two months' imprisonment. The respondent said he was not in the habit of selling mantles. He sold a glass chimney and gave the mantle free. He thought he was entitled to do this; but he now found that he was wrong, and therefore pleaded guilty. As to the difficulty of serving the interdict upon him, he was courting his wife in a shop in Belfast; but they interdicted him from going to the shop, and he had to give over courting. The Lord President said it was plain that in this case the respondent had defied the law, in order to make some gain by this very discreditable trade. The Court would put down this practice; and the respondent would be sentenced to two months' imprisonment.

The last report of the gas-stove hiring department of the Glasgow Gas Trust showed that, with the returns, there were still 14,849 stoves and kitchen ranges for use with gas; and also that there had been sold in the shape of gas-stoves, ranges, fires, burners, &c., 23,771 objects. In Glasgow there is no grumbling among the ironmongers because the Gas Commissioners hire and sell appliances for the consumption of gas.

Increase in the Price of Gas at Belper.—In consequence of the increased charge for coal, the Belper Gas Company announce an advance of 3d. per 1000 cubic feet in the price of gas.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 20.

Sulphate of Ammonia.—There has been no break in the upward movement; there having been very keen demand all through the week, and the closing quotations being £12 7s. 6d. to £12 10s. per ton, delivered f.o.b. at the ports. Prompt stuff is particularly scarce; and in order to secure June delivery, buyers have had to advance to about the spot level of prices. There has been similar improvement in the forward position; London having been done at £12 to £12 7s. 6d. per ton, Beckton terms, delivery over the last six months, and a further advance being subsequently required.

Nitrate of Soda is firm on spot, at 8s. 1½d. per cwt. for fine quality.

LONDON, *May* 20.

Tar Products.—Carbolic acid is selling freely; and there are eager buyers for forward delivery. The position is no doubt due to its now universally recognized character as a powerful and reliable disinfectant, and the advance of summer. Benzols are very dull; and the same remark applies to toluol, which has entirely lost the advantageous position it has occupied for so long a time. There is only a moderate market for solvent naphtha; and lower prices are mentioned. Creosote is moving freely on old contracts, but for new business somewhat less prices are being offered; while heavy oils are rather firmer both in demand and value. Pitch is steady; but the shipping season for it is practically over, and any business transacted is for next season's delivery—makers asking full rates for that period. There is no change in anthracene, which continues neglected; and quoted prices are nominal.

The average values obtaining during the week are: Tar, 15s. 6d. to 22s. 6d. Pitch, east coast, 27s. 6d.; west coast, 25s. Benzol, 90's, 6¾d.; 50's, 7¼d. Toluol, 9d. Solvent naphtha, 10d. Heavy naphtha, 1s. Crude, 30 per cent. naphtha, 3d. Creosote, 3¼d. Heavy oils, 67s. 6d. Carbolic acid, 60's, 2s. 1½d.; 75's, 2s. 9d. Creosote salts, 45s. Anthracene, nominal, "A," 4d.; "B," 3d.

Sulphate of Ammonia.—There is again a considerable advance in the value of this article. Sulphate is undoubtedly scarce, and stocks are very low. The home demand this year has been much larger than heretofore. There can be no doubt that English agriculturists are realizing that sulphate is of great manurial value, and for some purposes much superior to other nitrogenous manures. Value may be taken at £12 5s. to £12 10s., less 3½ per cent., according to port of shipment.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—With the Whitsuntide holidays, business in this district is as usual somewhat disorganized. There has been an extra pressure for supplies in anticipation of the usual stoppages of the pits, and collieries have been readily moving away all the output they can raise; while prices are exceedingly firm at the full list rates. As

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regards gas coal, a few contracts are now being settled at prices based pretty much upon the figures given last week; 9s. per ton having been secured on one local contract for ordinary Wigan four-feet gas coals. Generally this may be taken as about an average figure that will be held out for, with Wigan Arley coals averaging about 9s. 6d. up to 10s. per ton in special cases. For other descriptions of fuel, rates remain at late quotations. Prices average 12s. to 12s. 6d. per ton at the pit for best Wigan Arley, 10s. 6d. to 11s. for Pemberton four-feet and seconds Arley, 9s. 6d. to 10s. for common house coal, 9s. for steam and forge coal, 6s. 6d. to 6s. 9d. for best slack, 5s. 9d. to 6s. for medium, and 5s. 3d. to 5s. 6d. for common. Shipping is only moderate, with quotations for steam coal averaging about 9s. 6d. per ton delivered at the Garston Docks, 10s. at the High Level, Liverpool, and up to 10s. 6d. on the Manchester Ship Canal. The resolution provisionally adopted by the revived Coal Sales Association with regard to contracts with merchants, is meeting with a good deal of opposition on the part of the dealers; and not having yet received the sanction of some of the leading collieries, to enable it to be carried out generally, the matter is to be again brought up at a further meeting of colliery proprietors. The policy embodied in the resolution of not committing coalowners to fixed prices over long forward contracts, receives, however, the approval of the large collieries that have not yet given their actual adherence to the resolution; and it is very probable that such a provision may be introduced into the majority of contracts entered into for the ensuing season. With the present pressure of demand, of course, buyers in many cases are compelled to submit to conditions which, under other circumstances, would not for a moment be accepted; and very much will depend upon the course of trade in the immediate future, as to how far this proposed resolution of the Coal Sales Association will be adopted. In some districts it is already being enforced, but not yet to a sufficient extent to establish it on anything like a firm or permanent basis.

Northern Coal Trade.—The coal trade, after a slight relapse at the beginning of the week, shows recovery towards the close—partly because the fuller shipments of coals are now making up for the decreased consumption locally. Prices are lower than a week ago—for steam coals at least. Best Northumbrian steam coals are now from 12s. 3d. to 12s. 6d. per ton f.o.b.; and steam smalls are 6s. 6d. to 7s. In the gas coal trade, interest is centred in the large contracts for the Newcastle and Gateshead Gas Company, in which some active negotiation is now going on. It is admitted all round that the price to be paid will be considerably above that for the past year; but the actual figure is as yet in doubt. Possibly it will be something near 9s. per ton. For occasional cargoes, the quotation for best gas coals is now about 9s. 6d. per ton f.o.b. Gas coke is steady; and the output is better taken up now.

Scotch Coal Trade.—The coal market underwent no change during the week. Home trade is healthy; but shipping returns recede week by week. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 9s. 9d. to 10s. 6d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 199,132 tons—an increase of 4962 tons upon the previous week, but a decrease of 51,084 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,865,609 tons—a decrease of 132,502 tons upon the same period of last year.

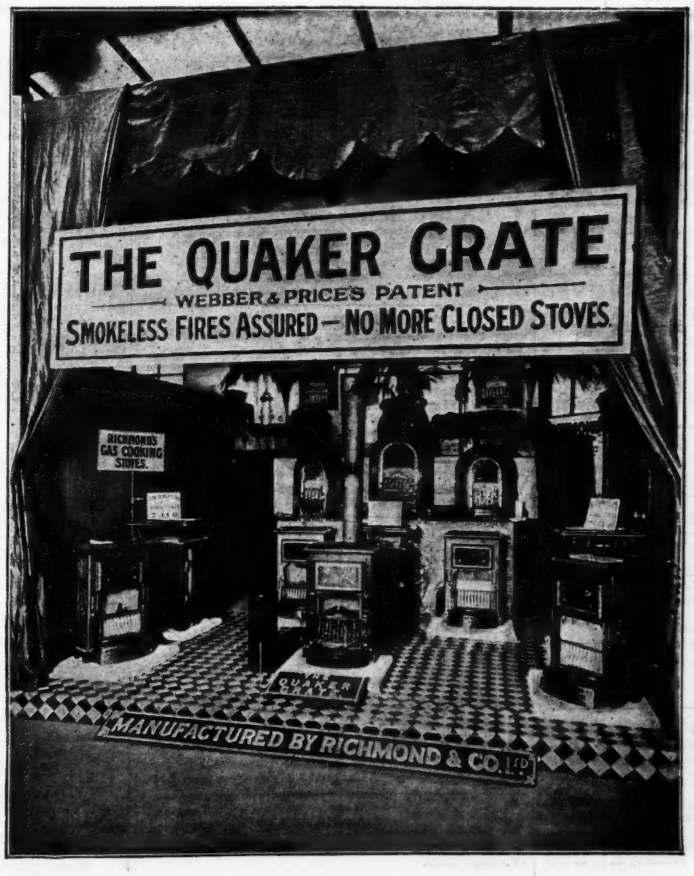
Reductions in Price.—The Rhyl Urban District Council have reduced the price of gas from 4s. to 3s. 7d. per 1000 cubic feet when used for lighting purposes. The Morecambe Gas Company announce that from the expiration of last quarter the price for gas used for lighting has been reduced from 3s. 8d. per 1000 cubic feet, less 3d. discount, to 3s. 3d., without discount. The price for gas used for cooking, heating, and motive power has been reduced from 3s. 3d., less 3d. discount, to 2s. 10d. without discount.

Huddersfield Gas Profits.—The Gas Committee reported at last Wednesday's meeting of the Huddersfield Town Council that the income from the gas-works for the last financial year was £85,608, against £79,852 in the previous year. The surplus was £9753, which was recommended to be apportioned as follows: £5010 (equal to a rate of 3d. in the pound) to be transferred to the borough fund in aid of the borough rate for 1899-1900, and the surplus of £4743 to the reconstruction account. The report was adopted.

Sales of Shares.—A few fully paid £5 shares (1879 issue) of the Portsmouth Water Company have lately been sold for £10 2s. 6d. and £10 5s. each. At a recent sale by auction, £135 of class "B" stock in the Sheffield Gas Company realized £250 per £100 of stock. Sixty 4 per cent. preference shares of £10 each in the Paignton Gas Company were sold last week at from £10 7s. to £10 10s. each. Messrs. J. Kidwell and Sons last Tuesday disposed of seven £5 original shares in the Brompton, Chatham, &c., Water Company, at £15 per share.

Lambeth Water Company.—The report of the Directors of this Company for the half year ended the 31st of March states that during this period 1698 houses and other supplies of water, estimated to yield an annual rental of £3996, were connected with the Company's works, as against 1380 houses, &c., producing a rental of £2978, laid on in the six months ended March 31, 1898. The number of new supplies connected during the half year is larger than in any corresponding period in the history of the Company. The revenue account exhibits an increase of £4864 in the water-rents, &c., and of £3056 in the expenditure, as compared with the corresponding period of 1897-8. The principal increases in the expenditure were distribution, pumping, and engine charges, and law and parliamentary (opposition) expenses, £729. The surplus transferred from the revenue account to the dividend and interest account is £81,899. There is to the credit of the latter account, after payment of interest on debenture stock, an available balance of £82,160. The Directors have decided to transfer £3000 to the contingency fund, which will then stand at £23,000. They recommend that a dividend at the rate of 7½ per cent. per annum be paid on the shares issued under the Company's Act of 1856, and of 10 per cent. per annum on all the other share capital of the Company; and that a payment of 5s. per cent. (being at the rate of ½ per cent. per annum) be made on all the share capital of the Company on account of deficiencies of previous dividends. These dividends will amount to £71,047; and a balance of £5116 will remain to be carried forward, after making provision for the payment to the Chamberlain of the City of London, under the sinking-fund clause of the Company's Act of 1886, in respect of debenture stock issued under that Act.

Building Trades' Exhibition,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Agricultural Hall, London.

The Water-Works Purchase Question at Maldon.—The final award in connection with the purchase of the water-works by the Maldon Town Council has been made; and it gives the amount due to the Company as £11,931 19s. 7d. The transfer is to be completed as early as possible. The estimated cost of the Council's Water Act is £1105; and of the arbitration, £2100.

The Quality of the London Water Supply.—In their report for the past month on the quality of the London Water Supply, Sir William Crookes and Professcr Dewar state that, of the 168 samples examined by them, all were found to be clear, bright, and well filtered. The report contains a table giving the averages for five supplies derived from the Thames during the first four months of the year. The figures show a gradual diminution in the quantity of organic carbon in the water. In spite of the excess of rain (0·17 inch), the water had less soluble matter in solution and less colour; while its bacteriological quality had improved, though at no time during the year had there been any deficiency in the effective removal of microbes by filtration.

New Water-Works for Ashford.—Last Tuesday week, Colonel W. R. Slacke held a Local Government Board inquiry at Ashford into an application by the District Council for sanction to the borrowing of £8000 for water-supply purposes. It was explained that the application was to enable the Council to purchase Henwood Farm, on which the wells were situated, and carry out certain work in connection with the town supply. The price of the freehold of the farm, which contained about 40 acres, was £4400, and it was estimated that 5 acres, which were available for re-sale, would fetch £2300. The total quantity of water pumped during the twelve months ended Dec. 31 was 45,548,396 gallons, giving a weekly average of 875,930 gallons. The minimum daily consumption was 62,052 gallons on April 10, and the maximum 178,200 gallons on July 16. There was no opposition.

Romantic Suicide by Coal Gas.—The Paris correspondent of the "Standard" recently sent over the following story: "A few days since, the arrest of a doctor was spoken of as probable in connection with certain incidents which were alleged to have taken place at an establishment dependent upon the Assistance Publique at Choisy-le-Roi. Yesterday it was announced that the doctor, in order to escape certain disgrace, had taken his life; and to-day the following details are published of the manner in which he carried his design into execution. The physician first informed his wife of the position in which he had placed himself, and of his intention to end his days. The lady, who is young, of considerable personal attractions, and very rich, listened to her husband's sad story, and having vainly endeavoured to deter him from carrying out his intention, finally acquiesced in his proposal. The doctor then announced that it was his intention to suffocate himself by opening the gas-brackets in his study. His wife talked with him through the door, while he pasted paper over all the cracks and apertures, and listened with her ear at the keyhole to his death struggles after he had turned on the gas. Finally, hearing the body fall to the ground, she concluded that the gas had done its work; and she then left the house, and informed some friends of the occurrence."

The Charge for Public Lighting at Haywards Heath.—The Cuckfield Rural District Council have received notification from the Haywards Heath Gas Company of their intention to reduce the charge for lighting ordinary lamps by 1s. 8d. each per annum; and the lamps in the Haywards Heath district by 1s. 11d. per lamp per annum.

The Assessment of the Newtown (Mon.) Water-Works.—The Newtown (Mon.) Water Company recently appealed against the rateable valuation of £667 5s. and £195 placed by the Overseers upon property of theirs in the district, with the result that at Quarter Sessions they secured a reduction to £325 10s. and £92 15s. respectively. We now learn that the taxed costs of the Company to be paid by the Assessment Committee, and allowed by the Clerk of the Peace, amount to £212.

A Reservoir Condemned.—Last Wednesday week, the Winsford Urban Council had under consideration a serious state of things which has arisen in connection with the extensive new reservoir which is being erected for them at Over. Disputes, which were settled by an arbitrator, arose between the Contractor and the Engineer; and on the death of the latter, Mr. H. Bancroft, of Manchester, was called in. He has practically condemned the structure; and the work, which should have been completed, has been stopped. The Council have already expended a large amount on the scheme; and Mr. Bancroft's estimate, submitted at the meeting of the Council, showed that the additional cost of strengthening the reservoir would be great. In the course of a discussion, it was pointed out that no blame was attachable to the Council, as they had carried out the scheme strictly in accordance with plans approved by the Local Government Board. It was decided that the Board should be asked to hold another inquiry before further expenditure is sanctioned.

Messrs. W. C. Holmes and Co., of Huddersfield, have received an order from the Manchester Corporation for one of their patent "new" scrubber-washers, having a capacity of 3½ million cubic feet of gas per diem; also one from West Hartlepool for a 2 million cubic feet machine.

Messrs. George Bray and Co., of Leeds, are now issuing to their various agents show cards attractively printed in colours, and fitted with patent clips in which to expose for sale their different specialities and burners—such as their "Special" burners and the Bray "Gas Economizer" more recently put upon the market.

Messrs. Richmond and Co., Limited, have just concluded successful exhibitions at Broughton, Coldstream, Dunbar, Rawmarsh, and Sheffield with cookery lectures by Misses Richmond, Smallwood, Dods, and Barker. Messrs. Fletcher, Russell, and Co., Limited, held last week an exhibition of gas appliances in the St. John's Parish Room, Bristol, under the auspices of the Gas Company, with lectures by Miss Helen Edden; also in the Albert Hall, Edinburgh, with Mrs. H. M. Young as lecturer. Messrs. R. & A. Main have been exhibiting at Paisley, with lectures by Miss Griggs. In the Literary Institute, Edinburgh, Messrs. John Wright and Co. held an exhibition last week, with lectures by Miss M. B. Terrace.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director, 160, 161, & 162, PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKLEMANN'S ORIGINAL "VOLCANIC" FIRE CEMENT and "VOLCUM" PASTE. Always ready for use in GAS-WORKS. Resists 4500° Fahr.

ANDREW STEPHENSON, 182, Palmerston Buildings, Old Broad Street, E.C.

"Volcanism, London."

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

BROTHERTON & CO. Offices: Commercial Buildings, LEEDS. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see May 9, p. 1182.]

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E. First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses: "Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SULPHURIC ACID for Sale. BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

PATENTS FOR INVENTIONS. Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

AMMONIACAL LIQUOR wanted. BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS CARBON Wanted, not less than 4-Ton Loads. Apply to the BRIMINGTON CARBON COMPANY, Bowerby Bridge, YORKS.

SEASON 1899.

BALE'S OXIDE OF IRON, of finest Quality. Summer delivery specially recommended for efficiency and economy. FIRE CEMENT, PAINT, and CHEMICALS. 120 and 121, NEWGATE STREET, LONDON, E.C.

TO GAS AND WATER OFFICIALS.

CYCLES of the Highest Quality at reasonable Prices. Catalogue, post free. For CASH, or on GRADUAL PAYMENT SYSTEM. *Sent on approval. Twelve Months' Guarantee.* MELROSE CYCLE COMPANY, COVENTRY.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS. Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEWBATTLE, DALKEITH, SCOTLAND.

IMPORTANT.

REPAIR your old Retorts with Patent STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Estimates for all kinds of Retort-Settings. Write CROWTHER, Retort Setter, and Sole Maker of Stickfast Fire Cement, Manor Street, HUDDERSFIELD.

GAS TAR wanted. BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PRACTICAL RETORT SETTER.

GEORGE NUTTALL, 32, Havelock Road, Saltley, Birmingham. Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs. Before placing Orders, please write for Estimate. Telegraphic Address: "SATURATORS, BOLTON."

SPENT OXIDE wanted.
BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SHEFFIELD CHEMICAL COMPANY, LIMITED.
BUYERS of Spent Oxide. Sellers of OXIDE OF IRON and SULPHURIC ACID.

GAS-FITTER (Age 22) wants Situation.
Well-up in Iron, Compo., Meter and Stove Fixing, Meter Reading and Collecting. Used to Acetylene Gas.
Address No. 3276, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Rental Clerk. Must be accustomed to the routine of a Gas Office.
Apply, with three Testimonials, to the SECRETARY, Gas Offices, MORECAMBE.

WANTED, a Man for Sulphate Making.
Must be capable of working the Continuous System, and willing to make himself useful in a Gas-Works. Wages 33s. per week to a capable Man.
Apply to the GAS COMPANY, Richmond, SURREY.

WANTED, for a few weeks near London, a good practical DRAUGHTSMAN used to Gas-Works construction.
Apply, stating Age, Qualification, and Salary required, to No. 3277, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Manager required for a small Works in Berks, making about 3 millions per annum. Must be capable of making the Gas, Service Laying, and Meter Fixing.
Apply, by letter, to No. 3278, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, two Carbonizing Foremen, accustomed to Regenerative Furnaces and Inclined Retorts.
Apply, by letter, enclosing *copies* of three recen Testimonials as to Character and Abilities, to No. 3227, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ROTHERHAM GAS-WORKS.
WANTED, immediately, a thoroughly capable FOREMAN. Experience of Inclines and Regenerators essentia'. Wages £2 per week. Eight-hour Shifts. Apply to
FRANK A. WINSTANLEY,
Engineer and Manager.

WANTED, a steady Man who has had experience in Bricklaying and Puddling Gas-holder Tanks.
Apply, by letter, giving References and Wages required, to No. 3279, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Directors of the Barking Gas Com- pany are prepared to receive APPLICATIONS for the post of MANAGER of their Works at Barking. Must be practically acquainted with the latest methods. Age not exceeding 35.
Applications, with Testimonials as to skill and trustworthiness, to be sent to the SECRETARY of the Company at the London Office, 55 and 56, High Holborn, LONDON, W.C.

RHYMNEY AND ABER VALLEYS GAS AND WATER COMPANY (SOUTH WALES).
THE Directors of the above Company require the services of a competent GAS and WATER WORKS MANAGER.
Applications, endorsed "Manager," stating Age, Experience, and Salary required, to be sent to me the undersigned on or before Friday, the 26th inst.
ARTHUR P. JAMES,
Secretary.
123, Queen Street, Cardiff.

GAS MANAGER.
WANTED, by the Witham Gas Com- pany, on the 1st of August next, a competent Man to take charge of their Works. Salary to commence at £80 per annum, with House, Coal, and Gas. Annual Make, about 9 millions.
Applications, by letter only, stating Age, and accompanied by not more than three recent Testimonials, to be addressed to W. B. Blood, Esq., Chairman of the Gas Company, Witham, Essex, on or before the 5th of June. Envelopes to be endorsed "Gas Manager."

WANTED, a second-hand Circular Cast- IRON TANK, constructed of Flanged Plates in good order. Any size between 25 and 40 feet diameter and 10 and 20 feet deep.
Apply, by letter, with Particulars and Price, and where can be seen, to No. 3271, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, at the Yeadon Gas- Works—
MOUTHPIECES, 19 in. by 14 in.; Lids, Cross-Bars, &c., complete.
ASCENSION, H, and DIP-PIPES, 5-inch.
Wrought-Iron HYDRAULIC MAIN, 29 ft. long, and 14 ft. 6 in. long, 20 in. by 18 in.; also one length, 14 ft. 7 in. long, 21 in. by 17 in., all U-shaped.
Five lengths of Cast-Iron HYDRAULIC MAIN, 7 ft. 6 in. each, 18 in. by 18 in.; also
Five lengths of Cast-Iron HYDRAULIC MAIN, 7 ft. 3 in. each, 20½ in. by 16 in., all U-shaped, the whole arranged for Five Retorts in a Setting.
FURNACE FRAMES, DOORS, BUCK-STAVES, &c., &c.
For further Particulars, apply to the MANAGER, Gas-Works, Yeadon, LEEDS.

FOR SALE—One 8-inch Dry-Faced Four- WAY VALVE, by Cockey, two Sets of RETORT MOUNTINGS complete for Beds of Sixes, 15-inch Circular RETORTS, including Hydraulic, Mains, Valves, &c.
For Prices and Particulars apply to the undersigned.
H. WIMHURST.
Gas-Works, Sleaford.

FOR DISPOSAL—One Round Station METER, 10,000 Cubic Feet capacity, by W. Parkinson and Co., London. Will be sold cheap. Also a large quantity of 3-feet CAST-IRON PIPING, Straight Lengths, Bends, &c. Has never been used. Can be seen here at any time by appointment.
JOHN RILEY AND SONS, Hapton, near ACCRINGTON.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE, cheap—
Two PURIFIERS, 8 ft. square by 4 ft. deep.
Two " 5 ft. " 4 ft. "
One " 5 ft. " 3 ft. "
One EXHAUSTER, 20,000 Cubic Feet per hour.
Two " 5000 " " "
Also CONDENSERS, SCRUBBERS, WASHERS, GASHOLDERS and TANKS, VALVES, &c., &c.
Apply to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

VESTRY OF ST. PANCRAS.
THE Vestry of St. Pancras invite offers to purchase disused GAS-LAMP COLUMNS. Any quantity up to 200. Specimen may be seen at the Vestry's Yard, No. 57, Pratt Street, Camden Town, N.W.
Offers to be addressed to
C. H. F. BARRETT,
Vestry Clerk.
Vestry Hall, Pancras Road,
London, N.W., May 11, 1899.

THE Wolverhampton Gas Company have FOR SALE, at their Horsley Fields Works, the following SECOND-HAND PLANT comprising: Retort-Fittings, Two Exhausters, Two Steam-Engines, Two Boilers, Two Sets of Vertical Cast-Iron Condensers, Two Scrubbers about 25 ft. by 7 ft., Station Meter, Governor, Cast-Iron Tanks, Weighing-Machine, Roof Principals, &c.
The above can be seen by appointment.
For further Particulars apply to the MANAGER, Gas Company, WOLVERHAMPTON.

TO BROKERS, IRONFOUNDERS, AND OTHERS.
THE Gas Committee of the Keighley Corporation have FOR SALE a number of MOUTHPIECES, 21 in. by 15 in., together with 5-inch Dip, H, and Ascension Pipes, and a considerable quantity of Cast Iron, which can be seen at the Gas-Works, Keighley.
Tenders to be sent (on form supplied) to the undersigned not later than Monday, the 29th inst., endorsed "Tender."
By order,
JOHN LAYCOCK,
Engineer and Manager.
Gas Offices, Keighley,
May 16, 1899.

HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY, LIMITED.
THE above-named Company have for SALE, at West Kirby Water-Works, the following PLANT: ONE CORNISH BOILER, 21 ft. by 6 ft., Single-Flue, Four Cross Tubes, 60 lb. Coburn Safety-Valve, Hopkinson High-Pressure and Low-Water Alarm. The Boiler is by J. Layfield, Burnley. Also HORIZONTAL ENGINE—Single Cylinder, 14½ inches diameter by 2 ft. 6 in. Stroke, Double Crank-shaft now working Pumps, and geared to Engine. Also two 12-inch PUMPS, 3 ft. 6 in. Stroke, four 9-feet Lengths Stand-Pipes above Working Barrels on each Pump. Large Air-Vessel. Rising Main or Pump Tree, 9 inches diameter, with Double Beat Valves top and bottom, with white metal faces, and spare Valves for Leather. Pump-Rods in Pitch Pine, 5 inches square, Scarf Joints and Plated. Depth from rose to surface 243 feet.
Can be seen at any time by appointment upon giving 24 hours' notice.
By order of the Board,
A. G. READDY,
Secretary.
8, Filey Terrace, Hoylake,
May 17, 1899.

COUNTY BOROUGH OF HUDDERSFIELD.
TENDERS FOR GAS COAL AND NUTS.
THE Gas Committee are prepared to receive TENDERS, from Colliery Proprietors only, for the supply and delivery of about 60,000 Tons of unscreened GAS COAL and screened NUTS for a period of Twelve Months, commencing the 1st of January, 1900.
Full Particulars and Form of Tender may be obtained on application to the Gas Engineer and Manager, Huddersfield.
Sealed Tenders, endorsed "Tender for Gas Coal," must be delivered, free of charge, addressed, in the handwriting of the Tenderer or his Agent, to the Town Clerk, Huddersfield, and delivered not later than Saturday, the 27th of May, 1899.
The Corporation do not bind themselves to accept the lowest or any Tender.
By order,
F. C. LLOYD,
Town Clerk.
Town Hall, Huddersfield,
May 11, 1899.

CITY OF CARLISLE.
THE Carlisle Gas Committee are pre- pared to receive TENDERS for the supply of COAL and CANNEL required at their Works during One Year from the 1st of July next.
Tenders to be delivered to the undersigned not later than June 3, 1899.
Forms of Tender and other Particulars on application.
C. B. NEWTON,
Engineer and General Manager.
Gas-Works, Carlisle,
May 18, 1899.

CITY OF CARLISLE.
THE Carlisle Gas Committee are pre- pared to receive TENDERS for the purchase of the surplus TAR produced at their Works for a period of One Year from the 1st of July next.
Tenders to be delivered to the undersigned not later than June 3, 1899
Further Particulars can be obtained on application.
C. B. NEWTON,
Engineer and General Manager.
Gas-Works, Carlisle,
May 18, 1899.

TO MANUFACTURING CHEMISTS.
TAR AND AMMONIA WATER.
THE Directors of the Loughborough Gas Company are prepared to receive TENDERS for the surplus TAR and AMMONIA WATER, to be produced at their Works for One Year, from the 30th day of June, 1899.
The estimated quantities will be about 350 Tons of Tar, and 900 Tons of Ammonia Water. The Tar and Liquor to be delivered into the Contractor's Boats at the Wharf, on the Derby Road, Loughborough.
The strength of the Liquor to be tested by Twaddel's Hydrometer (temperature 60°), and the Tender to state the price per ton of 4°, rising ½° degree up to 8°.
The Boats for the removal of the Tar and Liquor to be sent at such times as may be required. Payments 10th of following month.
Further Information may be obtained on application to the undersigned, to whom Tenders, in accordance with this advertisement, must be sent not later than the 31st day of May, 1899.
The Directors do not bind themselves to accept the highest or any Tender.
J. B. BALL, C.E.,
Manager.
Loughborough, May 19, 1899.

MANCHESTER CORPORATION GAS-WORKS.
AMMONIACAL LIQUOR.
THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the AMMONIACAL LIQUOR to be produced at the Gaythorn, Rochdale Road, and Bradford Road Gas-Works during a period of 21 months, commencing at Noon on the 30th day of June, 1899.
The Committee do not bind themselves to accept the highest or any Tender.
Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Ammoniacal Liquor," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 8th day of June, 1899.
Forms of Tender and further Particulars may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent of the Department.
A deposit of One Guinea (which will be returned on receipt of the Tender) must accompany each application for a Tender Form.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
May 12, 1899.

TO COLLIERY PROPRIETORS AND OTHERS.
THE Corporation of Birkenhead are pre- pared to receive TENDERS for the supply of COAL, COAL NUTS, THRO' and THRO' CANNEL, and CANNEL NUTS for Gas-Making Purposes for a period of One, Two, or Three Years, commencing from the 1st of July, 1899.
Forms of Tender, together with any further Information, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Birkenhead.
Tenders (accompanied by copy of recent Analysis) stating the Price per ton, delivered on to the Gas Works Railway Siding, must be sent in to me, sealed and endorsed "Tender for Gas-Works Coal," not later than Five o'clock in the afternoon of Friday, the 9th of June, 1899.
Also for a supply of STEAM COAL and SLACK, to be delivered at the Pumping-Stations of the Spring Hill, Claybrick Hill, and Borough Road Water-Works for a period of One, Two, or Three Years, commencing from the 1st of July, 1899.
Forms of Tender, together with any further Information, may be obtained from Mr. W. A. Richardson, C.E., Water Engineer, Town Hall, Birkenhead.
Tenders, stating the Price per ton delivered at the various Pumping-Stations, must be sent in to me, sealed and endorsed "Tender for Water-Works Coals," not later than Five o'clock in the afternoon of Friday, the 9th of June, 1899.
Also for a supply of WASHED SLACK, to be delivered at the Electrical Generating Station, Bentinck Street, for a period of One, Two, or Three Years, commencing from the 1st of July, 1899.
Forms of Tender, together with any further Information, may be obtained from Mr. W. Bates, Electrical Engineer, Bentinck Street, Birkenhead.
Tenders, stating the Price per ton delivered must be sent in to me, sealed and endorsed "Tender for Washed Slack," not later than Five o'clock in the afternoon of Friday, the 9th of June, 1899.
All deliveries to be made from time to time according to the requirements of the respective Engineers.
The Corporation do not bind themselves to accept the lowest or any Tender.
By order,
ALFRED GILL,
Town Clerk.
Town Hall, Birkenhead,
May 19, 1899.

THE Middleton Corporation have for SALE a quantity of COKE. Present Yard Price 9s. 2d. per ton. They are prepared to receive TENDERS for the purchase of 500 Tons, which Tenders must be addressed to the Chairman of the Gas, &c., Committee, endorsed "Tender for Coke," and delivered at my Office on or before the 31st of May, 1899.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
Near Manchester, May 15, 1899.

BOROUGH OF EVESHAM.

(GAS DEPARTMENT.)

THE Town Council are prepared to receive TENDERS for the supply of from 500 to 2000 Tons of Best Screened GAS COAL, to be delivered at one of the Evesham Railway Stations between July 1, 1899, and June 30, 1900.

Tenders, to be endorsed "Tender for Coal," and delivered to the undersigned on or before the 3rd of June next. No Forms of Tender supplied.

The Council do not bind themselves to accept the lowest or any Tender.

THOS. COX,
Town Clerk.

Evesham, May 18, 1899.

THE Selby Urban District Council are prepared to receive, on or before noon of Saturday, the 3rd day of June, 1899, TENDERS for the supply of about 3000 Tons of high-class GAS COAL, delivered in suitable Waggons at their Gas-Works' Siding, during Twelve Months, commencing about July 1 next, in such Quantities as may be required from time to time by the Gas-Works' Engineer.

Particulars and Printed Forms of Tender may be had on application (in writing only) from the undersigned, to whom all Tenders must be addressed, duly endorsed "Tenders for Coal."

The Council do not bind themselves to accept the lowest or any Tender.

By order,
T. H. ALDERSON,
Engineer and Manager.

Gas-Works, Selby,
May 18, 1899.

TENDERS FOR GAS COAL.

THE Directors of the Hartlepool Gas and Water Company invite TENDERS for 45,000 Tons of GAS COAL, to be delivered at their Gas-Works Sidings, West Hartlepool, during the Twelve Months ending the 30th of June, 1900, in such quantities and at such times as may be required.

The Coal must be freshly wrought, clean, free from Sulphurous Pyrites or other objectional matter, and to the satisfaction of the Company's Engineer.

Tenders must state the price per ton of 20 cwt., and whether Screened, Unscreened, or Nut Coal, and be sent to reach the undersigned on or before Tuesday, the 6th prox.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
THOS. TREWHITT,
Secretary.

Hartlepool Gas and Water Company's Offices,
West Hartlepool, May 18, 1899.

SCARBOROUGH GAS COMPANY.

AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company invite TENDERS for the whole of the AMMONIACAL LIQUOR, to be produced at their Works for One or more Years from the 1st day of July next.

Tenders may be submitted either at a fixed Price per Ton or on a Sliding-Scale, regulated by the price of Sulphate. Preference will, however, be given to the latter.

Further Particulars may be obtained on application to the undersigned.

Tenders (duly endorsed) must be delivered, addressed to the Chairman of the Company, not later than Noon, on Saturday, the 10th of June next.

The Directors do not bind themselves to accept the highest or any Tender.

By order,
J. HOLLIDAY,
Engineer and Secretary.

Gas Offices: 32, Westborough,
Scarborough, May 17, 1899.

EXMOUTH GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Exmouth Gas Company invite TENDERS for 7000 Tons or 4000 Tons, at their option for One or Two Years, of unscreened (through and through) first-class NEWCASTLE, DURHAM, or ALDWARKE MAIN GAS COAL, to be shipped in such quantities (by Sailing Vessel only) or by Rail, and at such times as may be required, commencing from the 1st of August next.

Tenders, to be accompanied by Working Analysis, and Prices may be quoted c.i.f. or f.o.b. at Exmouth Docks, or f.o.r. Exmouth Railway Station.

The Coals to be Clean, Dry, and Fresh Worked.

Short Weight or Inferior Quality to be allowed for.

Sealed Tenders to be sent to the undersigned, addressed to the Chairman of the Gas Company, and endorsed "Tender for Coal," not later than Monday, June 5, 1899.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

No Form of Tender issued.

By order,
JAMES T. FOSTER,
Secretary and Manager.

Gas-Works, Exmouth,
May 18, 1899.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Wrexham Gaslight Company invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR to be produced at their Works during the Year ending the 30th of June, 1900. Estimated total quantity of Tar 600 Tons, and Liquor 700 Tons.

Sealed and endorsed Tenders to be received on or before the 31st inst. by the undersigned.

WM. HEYWARD,
Secretary.

Gas Offices, Wrexham,
May 10, 1899.

WADEBRIDGE WATER-WORKS.

TO CAST-IRON PIPE MANUFACTURERS.

THE Wadebridge Urban District Council are prepared to receive TENDERS for the supply of about 350 Tons of 6-inch, 4-inch, and 3-inch CAST-IRON PIPES.

For Specifications and Conditions apply to Mr. Geo H. Harris, Engineer, Wadebridge, Cornwall.

A deposit of £2 2s. will be required with each application, to be returned on a *bonâ fide* Tender being received.

The Council do not bind themselves to accept the lowest or any other Tender.

WALTER O. WELLINGTON,
Clerk to the Council.

Dated Wadebridge,
May 13, 1899.

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee of the above Council are prepared to receive TENDERS for the supply of 12,500 Tons of best GAS COAL and 1000 Tons of CANNEL required in each Year for One, Two, or Three Years from June 1, 1899.

Specifications and Forms of Tender can be obtained by applying to Mr. John Marsland, Engineer and Manager, Gas-Works, Sowerby Bridge.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders must be sent in not later than Tuesday, May 23, 1899, endorsed "Tender for Coal" or "Cannel" respectively, and addressed to

GODFREY RHODES AND EVANS.

Commercial Bank Chambers, Halifax,
May 9, 1899.

DERBY GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 50,000 Tons of screened soft COAL and soft COBBLES or NUTS.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Full Particulars and printed Forms of Tender can be obtained on application to the undersigned, at the Gas Offices, Friar Gate, Derby.

Tenders, sealed and endorsed, to be sent in not later than May 29, 1899.

By order,
RICHARD FISHER,
Secretary.

Gas Offices, Derby,
May, 1899.

LURGAN GASLIGHT AND CHEMICAL COMPANY, LIMITED.

COAL WANTED.

THE Directors invite Tenders for the supply of Three Thousand Tons of best quality screened GAS COAL, delivered into Lighters, or placed on Rail, at Belfast.

Five Hundred Tons of the required quantity should be Scotch Coal, suitable for use in Hislop's Patent Regenerative Furnaces.

The Coal must be delivered in such quantities and at such times as the Directors may fix; but a large proportion can be taken before the 1st of November.

Each Cargo to be accompanied by a Certificate as to place of origin.

Tenders (in sealed envelope), accompanied by reference to Gas-Works using the Coal offered, should reach me not later than Seven o'clock in the Forenoon of Saturday, the 3rd of June, 1899.

The Directors do not bind themselves to accept the lowest or any Tender.

FRED. W. MAGAHAN,
Secretary.

Gas-Works, Lurgan,
May 1, 1899.

COUNTY BOROUGH OF BURY.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Corporation are prepared to receive TENDERS for the supply, for One, Two, or Three Years, of—

85,000 Tons of GAS COAL per annum.
500 " BURGY "
200 " HOUSE COAL "

The same to be delivered in such quantities and at such times as the Gas Engineer of the Corporation may from time to time order.

Printed Forms of Tender and Conditions of Contract may be obtained on application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Bury.

Tenders, which must be on the printed forms, and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Bury, endorsed "Tender for Gas Coal," to be delivered not later than Friday, the 16th of June, 1899.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bank Street,
Bury, May 19, 1899.

THE Directors of the Skipton Gas Com- pany are prepared to receive TENDERS for the purchase and removal of the surplus TAR and AMMONIACAL LIQUOR produced at their Works during Twelve Months ending June 30, 1900.

Particulars may be obtained from the undersigned, to whom endorsed Tenders may be sent not later than June 13 next.

J. HAIGH,
Secretary.

Skipton, May 16, 1899.

HAWORTH URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the supply of Four CONDENSERS and a new EXHAUSTER as per Plans and Specifications, which may be seen at the Gas-Works, Haworth.

Tenders to be sent to me not later than Thursday, June 1, endorsed "Tender for Gas Extensions."

WM. ROBERTSHAW,
Clerk.

Burlington Chambers, North Street, Keighley.

BOROUGH OF NELSON.

THE Gas Committee invite Tenders for the supply of a quantity of FIRE-CLAY RETORTS and FIRE-CLAY BRICKS.

Further Information and Forms of Tender may be obtained from Mr. Wm. Foster, Engineer and Manager.

Tenders, endorsed "Retorts and Bricks," to be sent to the undersigned not later than the 3rd day of June, 1899.

R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson,
May 17, 1899.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late Mrs. Catherine Brown, jointly with Mr. Henry Brown.

RAYLEIGH.

FREEHOLD GAS-WORKS.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, Tokenhouse Yard E.C., on Tuesday, May 30, at Two o'clock,

THE FREEHOLD GAS-WORKS
OF THE RAYLEIGH GAS COMPANY, AT
RAYLEIGH, ESSEX.

Advantageously placed in a central position, within about 350 yards of Rayleigh Station and Goods Yard on the G.E.R., affording excellent facilities for economical carriage of Coal, &c. The Works comprise: RETORT-HOUSES, GASHOLDER, COAL-STORE, CONDENSER, WASHER-SCRUBBER, Three PURIFIERS, STATION METER, GOVERNOR, &c., MANAGER'S HOUSE, OFFICE, and WORKSHOP, together with the DISTRIBUTING PLANT. The whole to be sold as a GOING CONCERN and with POSSESSION on COMPLETION.

May be viewed, and Particulars with Conditions of Sale obtained, of LOXLEY, ELAM, AND GARDNER, Solicitors, 80, CHEAPSIDE, E.C.; of Mr. ROBERT JAMES TWYFORD, Solicitor, 44, FINSBURY PAVEMENT, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

CATERHAM AND DISTRICT GASLIGHT AND COKE COMPANY, LIMITED.

250 £10 FIVE PER CENT. PREFERENCE SHARES.

(TO BE ISSUED AS FULLY PAID.)

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 30, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

IMPORTANT SALE OF GAS AND WATER STOCKS AND SHARES

IN THE

COMMERCIAL GAS COMPANY,
TOTTENHAM AND EDMONTON GAS COMPANY,
SOUTH-WEST SUBURBAN WATER COMPANY,
HERTFORD GASLIGHT COMPANY,
HORSHAM GAS COMPANY, and
PETERBOROUGH GAS COMPANY.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 30, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

WESTGATE AND BIRCHINGTON GAS COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Wednesday, June 14, at Two o'clock, precisely

500 £10 "C" SHARES

IN THE

WESTGATE AND BIRCHINGTON GAS COMPANY,

Ranking for a Maximum Dividend of 7 per cent., and entitled, in view of the distribution on the Company's Ten per Cent. Capital to the 31st of December last, to *pro rata* Dividend of £4 9s. per cent.

Particulars of Messrs. HOUSEMAN & Co., Solicitors, 3, Prince's Street, Storey's Gate, WESTMINSTER, S.W.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

THE Widnes Corporation invite TENDERS for the supply of about 21,000 Tons of GAS COAL (Slack, "Through and Through," or Screened Coal) for the period ending the 30th of June, 1900, to be delivered at the Gas-Works, Widnes.

Conditions and Forms of Tender may be obtained from Mr. I. Carr, M.Inst.C.E., Gas Engineer, Widnes.

Tenders, endorsed "Gas Coal," to be delivered to the undersigned not later than the 2nd of June prox.

The Corporation do not bind themselves to accept the lowest or any Tender.

H. S. OPPENHEIM,
Town Clerk.

Town Hall, Widnes,
May 17, 1899.

TENDERS FOR GAS COAL.

THE Teignmouth Urban District Council invite TENDERS for the supply of about 1000 Tons of the best NEWCASTLE GAS COALS for One Year ending the 31st of May, 1900, in such quantities as may be required from time to time.

Tenders to state the price f.o.b. at the Port of dispatch.

Sealed Tenders, marked "Coals," accompanied by an Analysis of the Coal offered, to be delivered at the Clerk's Office at the Town Hall, Teignmouth, not later than Ten o'clock a.m., on Tuesday, the 6th day of June, 1899.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
W. R. HALL JORDAN,
Clerk.

IMPORTANT SALE OF GAS SHARES.

MR. W. H. SWANNELL has received Instructions from the Directors of the Rickmansworth Gaslight and Coke Company, Limited, to SELL BY AUCTION, at the Town Hall, Rickmansworth, on Wednesday, June 7, 1899, at Five o'clock precisely, 700 NEW £5 SHARES; being the issue of Additional Capital of the said Company, ranking for a prescribed rate of Dividend not exceeding 7 per cent., subject to the Sliding-Scale mentioned in the Rickmansworth Gas Order, 1885.

Particulars and Conditions of Sale may be had of HARVEY W. FELLOWS, Esq., Solicitor, RICKMANSWORTH; and of the AUCTIONEER, High Street, RICKMANSWORTH.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE BY TENDER OF £35,000 THREE-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £107 10s. PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £35,000 of THREE-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK, to be issued under the Provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1896.

Particulars and Forms of Tender may be obtained on application to the undersigned; and Tenders must be sent in so as to be received at the Office of the Company not later than Ten a.m. on Tuesday, the 30th of May, 1899.

The Stock will be allotted to the highest bidders; but no tender will be accepted at a lower price than at the rate of £107 10s. money for each £100 Debenture Stock.

By order,
THOMAS WADDOM,
Secretary.

Chief Offices: 35, Grainger Street West,
Newcastle-upon-Tyne, May 8, 1899.

NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

ENRICH YOUR GAS
WITH
CHEAP BENZOL.

AT to-day's Price of Benzol, Illuminating POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to **SADLER & CO., MIDDLESBROUGH.**

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . .	10,500 Cubic Feet.
Illuminating Power . . .	16·4 Candles.
Coke	68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

The Wallsend & Hebburn Coal Company, Ltd.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

KENT WATER-WORKS COMPANY.

SALE BY TENDER OF £40,000 FOUR-AND-A-HALF PER CENT. DEBENTURE STOCK.

MINIMUM PRICE £150 PER CENT.

THE Directors invite Tenders for the Issue, on Sale to the highest bidders, of £10,000 FOUR-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK, authorized to be raised under the Kent Water-Works Act, 1888. The Ordinary Capital of the Company raised is £868,000, which comprises £708,000 Capital Stock, on which the Dividend for the last Half Year was at the rate of 10 per cent. per annum, with a further Dividend of 4 per cent. per annum on account of back Dividends, and £160,000 New Capital Stock, on which the full Dividend of 7 per cent. has been paid since its issue.

The Loan Capital raised is £83,000—viz., £42,000 by Mortgages, and £40,000 by Debenture Stock.

Tenders must be sent in on or before Thursday, the 15th of June.

Forms of Tender, with Particulars and Conditions, may be obtained on application to the Secretary.

Tenders below the Minimum Price of £150 for each £100 of Stock cannot be accepted.

By order of the Directors,
ALEXANDER DICKSON,
Secretary of the Company.

Kent Water-Works Offices,
Mill Lane, Deptford, S.E.,
May 17, 1899.

Crown 4to., Price 3s. 6d.

GASHOLDER AND TANK

(Of One Million Cubic Feet Capacity)
AT THE
SUTTON GAS-WORKS.
Designed and carried out by
F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.
MEMBER OF THE INSTITUTION OF GAS ENGINEERS,
MEMBER OF THE SOCIETY OF ARTS,
CONSULTING ENGINEER.

EMBRACING NOTES ON GASHOLDER CONSTRUCTION GENERALLY

REPRINT OF A SERIES OF ARTICLES IN THE "JOURNAL OF GAS LIGHTING," &c., WITH THE ACCOMPANYING PLATES.

Other Works by the same Author.

The Guide-Framing of Gasholders, and Strains on other Structures in Gas-Works	**6s. 0d.**
Gasholders With or Without Guide-Framing: A Discussion; and Literature on Gasholder Construction	**1s. 0d.**
Flow of Gas, and Proportioning Gas-Mains	**7s. 6d.**

PUBLISHED BY
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500 Cubic Feet.
Illuminating Power . .	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
Ash	2·04 Ash.

For Prices, &c., apply to

W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THE ACETYLENE ILLUMINATING CO., LTD.,
MANUFACTURERS OF CARBIDE OF CALCIUM,
63, QUEEN VICTORIA STREET, LONDON, E.C.,
and FOYERS, SCOTLAND.

(The Acetylene Illuminating Company, Limited, Incorporated in May, 1895, as a Private Development Company, was the First Undertaking established in Europe for the Manufacture of Carbide of Calcium.)

NOTICE.

THE Acetylene Illuminating Company, Limited, possesses an exclusive Licence for the United Kingdom to use for the manufacture of Carbide of Calcium for Light, Heat, and Power Purposes, the Inventions which are comprised in Mr. Willson's British Letters Patent. The Company is also similarly licensed under the British Letters Patent owned by the British Aluminium Company, Limited, so far as these relate to the manufacture of Carbide of Calcium for the same purposes.

The Patents have been submitted to Mr. Fletcher Moulton, Q.C., Mr. Roger Wallace, Q.C., and Mr. Arthur Colefax, who have given the following joint opinion:—

"In our opinion The Acetylene Illuminating Company, Limited, by their Patents control the process "by which alone Calcium Carbide can be commercially produced by electricity, and are also "entitled thereunder to prevent the importation into "this country of Calcium Carbide so produced."

The Acetylene Illuminating Company, Limited, are determined to permit of no Infringement of their Patent Rights, and have brought an Action against the Midland Acetylene (Parent) Syndicate, Limited, to restrain them from manufacturing Carbide of Calcium by means of the Electric Furnace. The Acetylene Illuminating Company intend in future to bring actions against all Infringers of their Patents, whether Manufacturers or Importers, and against all Purchasers of Carbide of Calcium made or imported in Infringement of their Patent Rights.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

THE READ-HOLLIDAY ACETYLENE COMPANY, LIMITED, Acetylene Gas Engineers and Carbide of Calcium Manufacturers, HUDDERSFIELD.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

TINKER AND HOLLIDAY, LIMITED, Carbide of Calcium Manufacturers, HAZELHEAD, SHEFFIELD.

TUBES AND FITTINGS

ALL KINDS

WRITE FOR PRICES

STAFFORDSHIRE TUBE Co., BIRMINGHAM.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

SANDELL'S

Gas Companies' Account Books.

The Gas Companies' Expenditure Journal.

With Printed Headings and Analyzing Guide, for keeping the Expenditure of Gas Companies upon the easiest and most correct method, and in accordance with the provisions of the Gas-Works Clauses Act of 1871. Size: 16⅜ in. by 17½ in.

Price: Half-bound, Cloth Sides, Two Quires, 36s.; Three Quires, 45s.

This Book and its predecessor (on the same principle, have been in use since 1867.

The Gas Companies' Rental-Book.

A companion Book to above, with Printed Headings and Illustration, for keeping the Consumers' Accounts with Gas Companies on labour-saving principles. Compact and Precise. A boon to Secretaries, Accountants, and Auditors.

Size and Price as above.

Consumers' Names are only written once in every two years by this system.

The Analyzed Wages Book.

Compiled for use in conjunction with the above Expenditure Journal, with Printed Headings, and adapted to the form for making up the Annual Accounts under the provisions of the Gas-Works Clauses Act, 1871. Size: 15 in. by 10½ in.

Price: Half-bound, Cloth Sides, Two Quires, 15s.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, near DEWSBURY.

WELDON MUD
FOR
GAS PURIFICATION,

For use in the

RECOVERY OF SULPHUR,

ALSO

Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:

GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

THOMAS TURTON
AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE
90, CANNON STREET, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

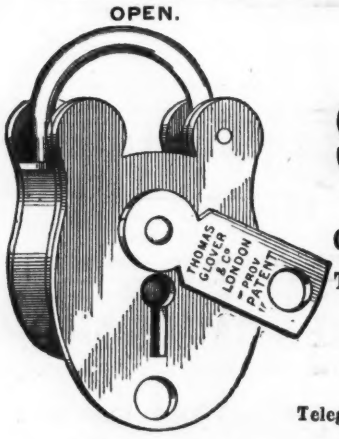
ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

SECURE PADLOCK

PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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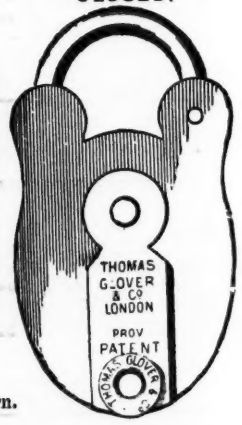


Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

THOMAS GLOVER & CO., LTD.,
DRY GAS-METER MANUFACTURERS,
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

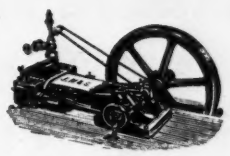
BRISTOL:
28, BATH STREET.
Telegraphic Address: "GOTHIC."
Telephone No. 1003.

BIRMINGHAM:
1, OOZELLS STREET.
Telegraphic Address: "GOTHIC."

MANCHESTER:
37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."
Telephone No. 8398.

GLASGOW:
ARGYLE WORKS, KINNING PARK.
Telegraphic Address: "GASMAIN."
Telephone No. 1525 South Side.

JAMES MILNE & SON, LTD.,
GAS ENGINEERS,
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.



INCLINED RETORTS
UP-TO-DATE FURNACES
AND SETTINGS.

J. & H. ROBUS, 20, Bucklersbury, London, E.C.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
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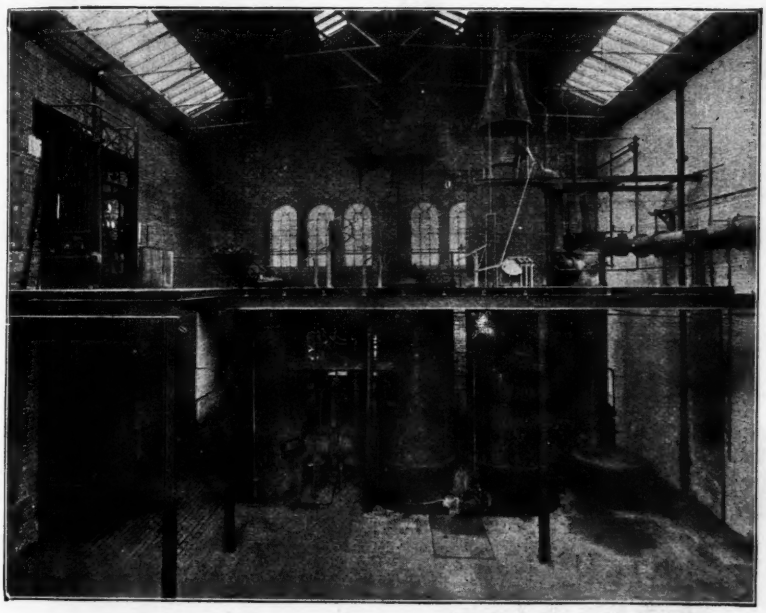

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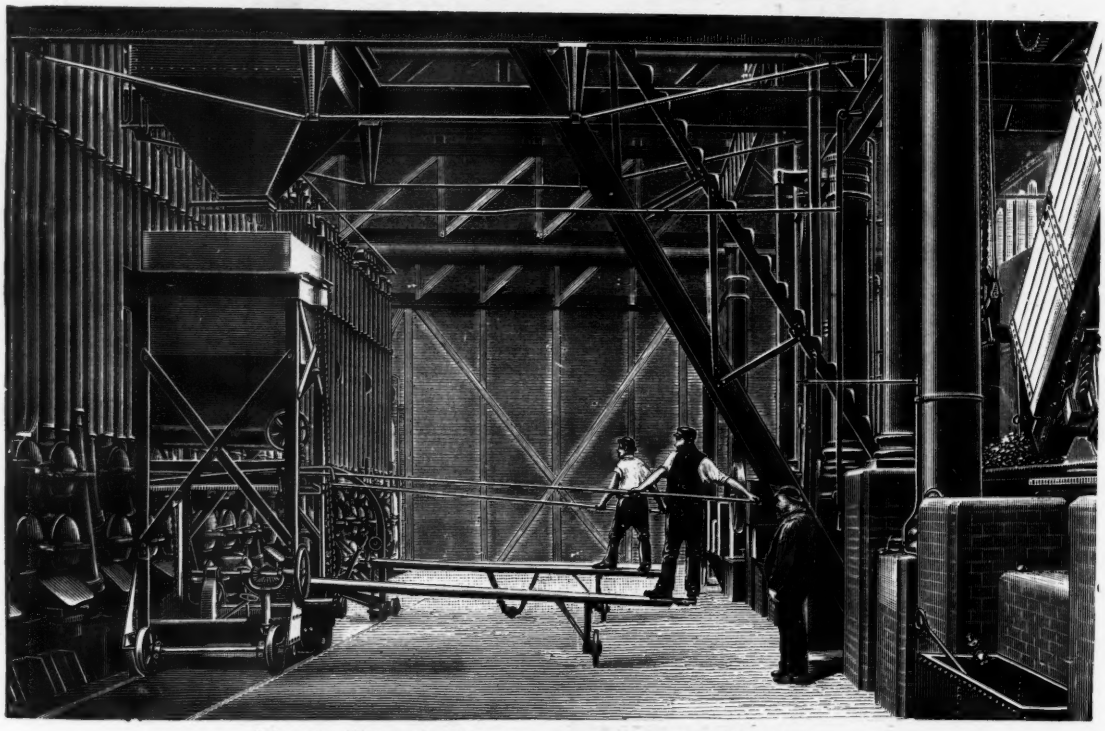

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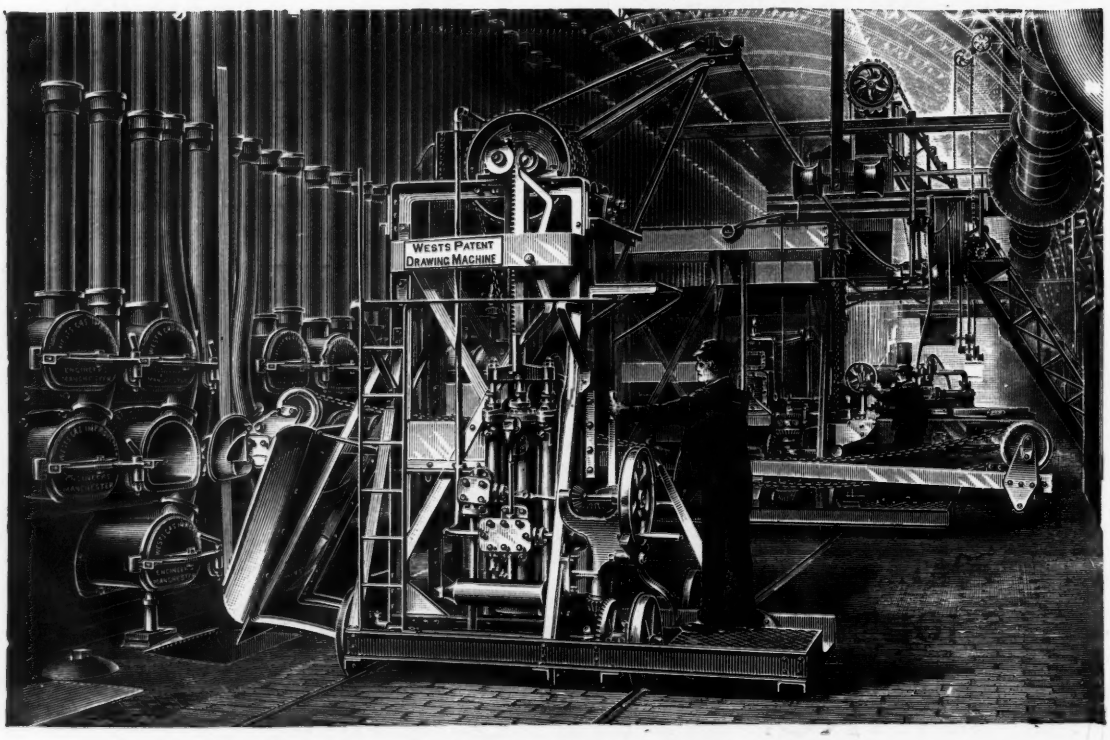

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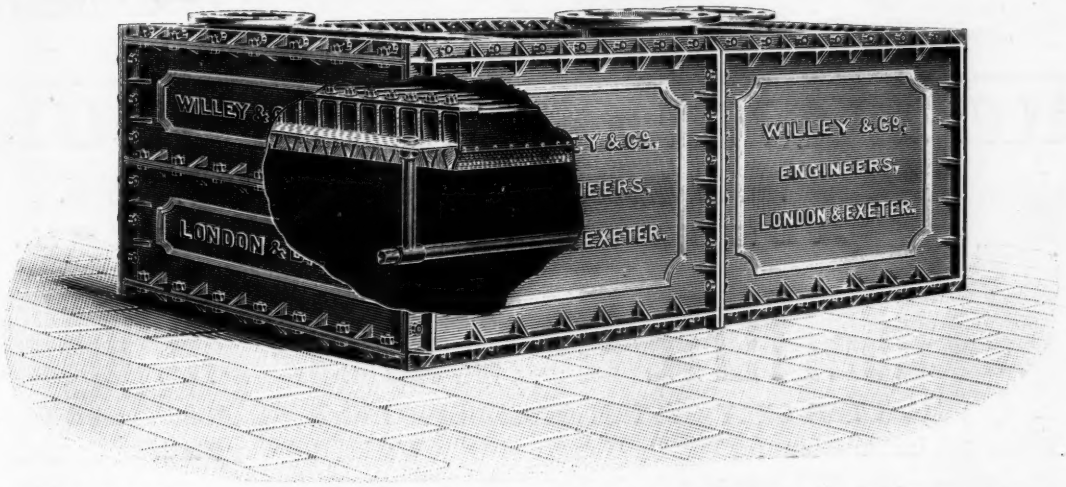

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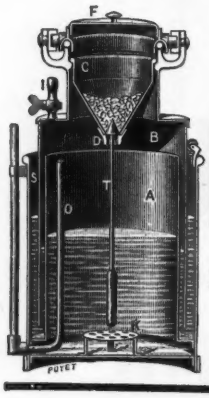

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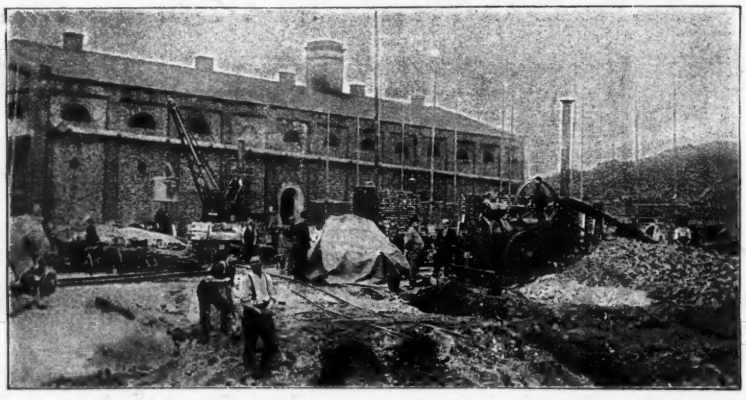

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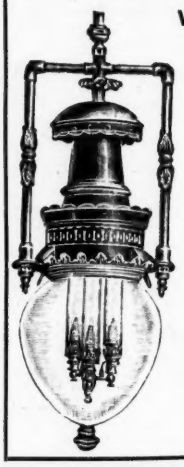

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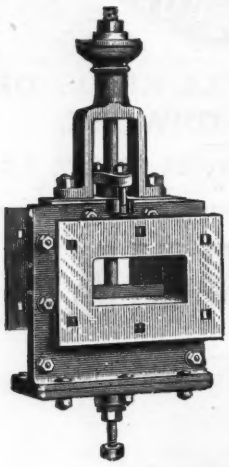

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